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In This Issue—*Do You Fill the Bill?*

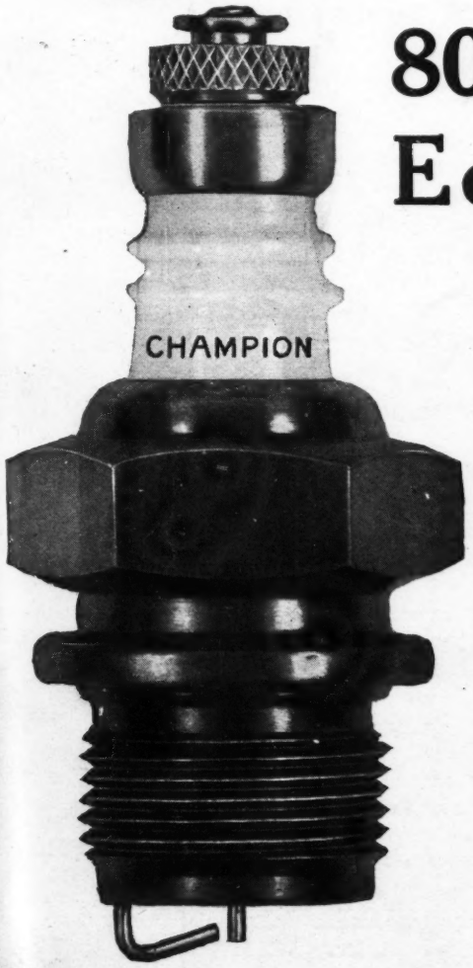
MOTOR AGE

Volume XXXVII
Number 18

PUBLISHED WEEKLY AT THE MALLERS BUILDING
CHICAGO, APRIL 29, 1920

Twenty Cents a Copy
Three Dollars a Year

Champion Dependable Spark Plugs



80% Tractor Equipment

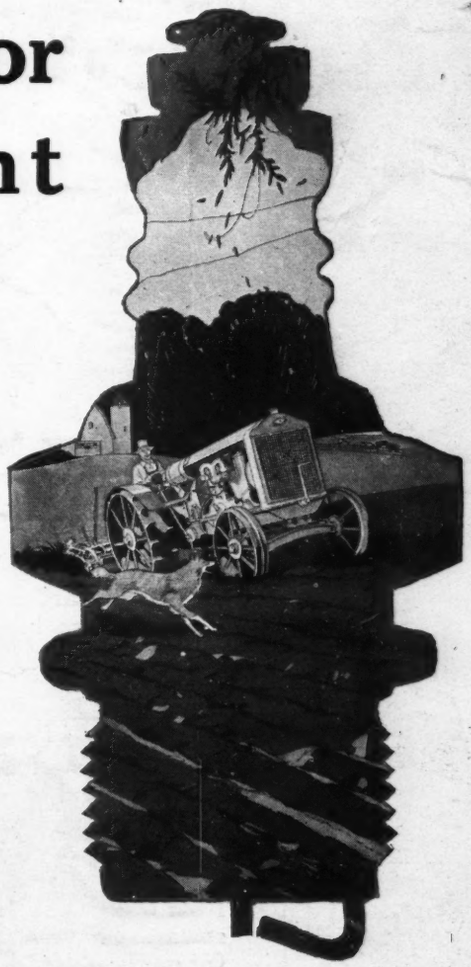
WORKING under full load ten to twelve hours at a stretch, the tractor gives spark plugs their most severe test.

Champion Spark Plugs with their famous No. 3450 Insulator are so universally recognized as best adapted to fit the unusual conditions of shock, heat and temperature changes in tractor service that they have been chosen as factory equipment on 80% of all tractors being built today.

There is a Champion Spark Plug specially designed for every type of gasoline engine.

Dealers should make sure their stocks are complete.

Be sure the name Champion is on the Insulator and the World Trade Mark on the Box.



Champion Spark Plug Company, Toledo, Ohio

Champion Spark Plug Company, of Canada, Limited, Windsor, Ontario

Entered as second-class matter Sept. 19, 1899, at the post office at Chicago, Ill., under act of March 3, 1879

Carbon Remover

An occasional dose will stop that knock—quiet the motor—and save the batteries. You can do it yourself in ten minutes.

Keep Your Car Young

Radiator Cement

In liquid form and easy to use. Will ordinarily seal leaks in from two to ten minutes.

Top Dressing

Johnson's Black-Lac is the ideal top dressing. One coat imparts a rich, black surface just like new.

It isn't fair to yourself or to your car to run it without any attention and then sell it at a big loss. With but little effort you, yourself, can keep your car in such condition that the depreciation will be very slight. We offer for your use **Johnson's Car Savers.** No experience is necessary for their use. They can all be applied by the amateur with perfect satisfaction.

JOHNSON'S Car Savers are of the very highest quality that can be produced. You will find cheaper makeshifts on the market, but when you insist upon **Johnson's** you are taking no chance, for all of our preparations are fully guaranteed.

Hastee Patch

A quick, permanent, inexpensive repair for tubes and casings. Can be applied in three minutes at a cost of 2 cents.

Auto-Lak

A spendid elastic varnish for bodies, hoods and fenders. A coat will increase the value of your car from 10% to 35%. Dries in 24 hrs.

JOHNSON'S Car Savers

Start today to reduce the depreciation of your automobile. An hour or two every month and **Johnson's Car Savers** will prove their value in dollars and cents when you come to sell or turn in your car.

Johnson's Car Savers have been on the market for several years. Millions of cans have been used by motorists everywhere with entire satisfaction.

For years our employees have been our partners and share the profits. Because of this personal interest unusual care and skill enter into the manufacture of the Johnson products—overhead is reduced to the minimum and we are enabled to sell at a very slight increase over pre-war prices, notwithstanding the tremendous advances on all of our raw materials.

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Will remove pits and foreign substances from valves, giving a velvet sea. Will not cut grooves.

Stop Squeak Oil

It seeps between the springs, thoroughly lubricating them. Makes your car ride easier, reduces the liability of spring breakage.

S. C. JOHNSON & SON

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MOTOR AGE

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MOTOR AGE

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"NORMA"

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PRECISION
BALL BEARINGS
(PATENTED)

The steady shrinkage of the dollar emphasizes the need for using its diminished buying power to best advantage. Discrimination in values on the part of buyers is maintaining—in the face of advancing prices—the demand for these high-grade cars, trucks, tractors and power boats carrying "NORMA" equipped magnetos and lighting generators. Thus dependable electrical systems are important factors in their serviceability.

See that your electrical apparatus is "NORMA" equipped.

THE NORMA COMPANY OF AMERICA
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SERVICE

Ball, Roller, Thrust and Combination Bearings

Some of Them Will—"Ask You"!

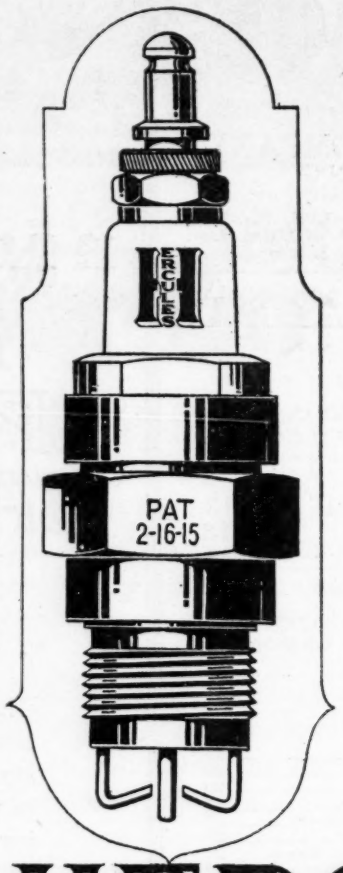
Every one of the thirty million Hercules advertisements in the biggest publications this year bears the message—"Ask your dealer for them."

Your sales force can switch these inquiries to some other plug.

But you are to blame if the customer does not get value.

You can handle Hercules—"cash in" on Hercules advertising — have Hercules Dealers' Helps to build your business.

Ask us for the Hercules Dealer's Proposition.



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The "flexatite" assembly of HERCULES plugs eliminates compression leakage---stops waste of power. The stone-porcelain insulators are "break-proof." Equip your motor complete, insuring perfect combustion, and utilization of every ounce of power. Chart showing correct sizes for every motor on request. Eclipse Manufacturing Company, Indianapolis, U. S. A.

Ask Your Dealer for

HERCULES
GIANT SPARK PLUGS

This is another of the thirty million Hercules Advertisements that will reach every car owner through the leading monthly and weekly magazines and farm papers during 1920.

ECLIPSE MFG. CO., Indianapolis, U. S. A. Makers of

HERCULES
GIANT SPARK PLUGS

Vol. XXXVII No. 18 CHICAGO, APRIL 29, 1920. $3.00 Per Year

MOTOR AGE

DO YOU FILL THE BILL?

What Are the Qualifications Necessary to an Ideal Service Salesman or Manager

BEFORE we make any attempt at answering the question as to what qualifications the ideal service manager must possess we must stop and see just what member of our organization this service manager is. He is not or should not be the foreman of the shop or the superintendent. He is the point of contact between customer and the dealer's business. He is the one that greets the customer the minute he comes in and sees that the customer leaves with the feeling that everything was done well. He need not necessarily be an expert mechanic, although it is highly desirable that he knows the particular car his employer is selling and servicing.

In the small town dealer's establishment the service manager may have to fill several jobs for obvious reasons. He may be the shop foreman, trouble shooter and service manager, but even so, there are things he must know and do that will make him valuable to the dealer. Obviously the service methods of the dealer in a large city will differ from those used by the small town dealer. And while the methods might differ, brought about largely by the difference in the volume of work, the product to be sold, i. e., service, is the same. Every car owner, whether he lives in a large or small town, likes to get good attention and waiting upon, and that is one of the first jobs of the ideal service manager.

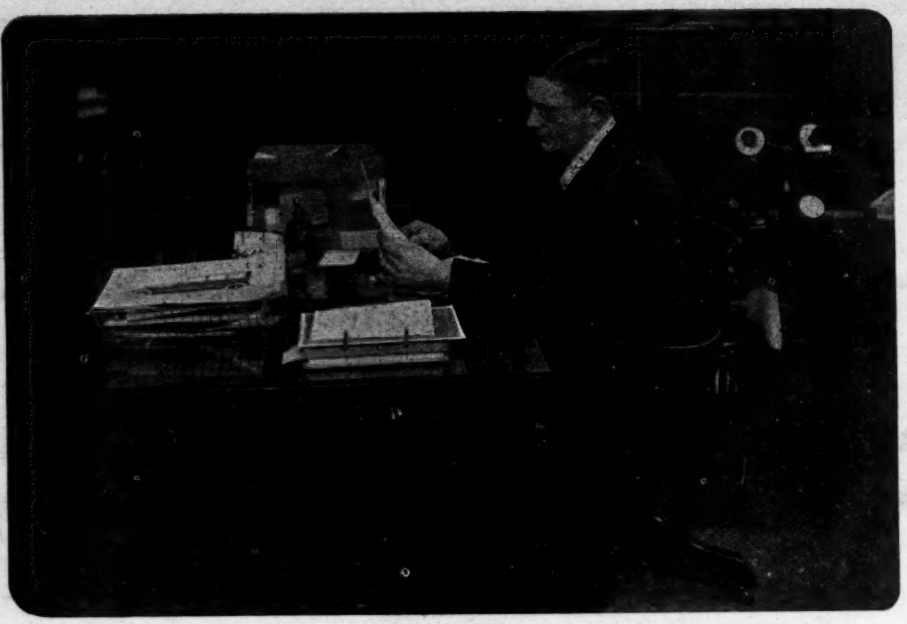
WHETHER the dealer runs a large or small business, there is of necessity one individual in the institution who acts as the point of contact with customers who come in for repairs, adjustments, parts or any work incident to the servicing of cars. This individual might be the dealer himself, the shop foreman, or anyone else connected with the organization, depending largely on the size of the business, town, etc.

The motor car business has reached that stage where to-day even the smaller places of business have a "service manager," the man who carries out the service policies of the house. He might or might not be the one who makes the first contact with customers, depending again on the size of the institution. The service manager of a large institution may have under him one or more service salesmen whose sole purpose it is to meet the customers. The service manager might be the shop foreman, but he cannot be upheld as an ideal service manager unless he has working under him a service salesman, or whatever else we choose to call him, whose specialty it is to create a desire on the part of customers, to come in and do business with the organization.

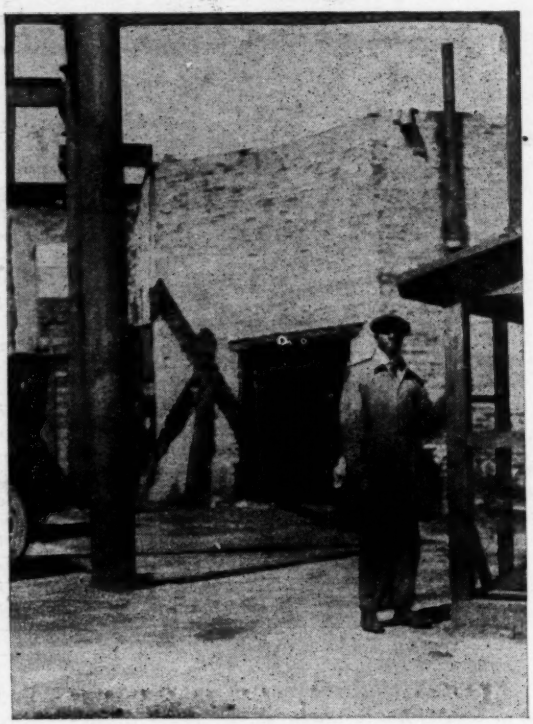
The vast majority of service stations, whether under the same roof with the salesrooms or not, generally have one

man who goes under the title of service manager. He is, of course, also the service salesman and as above stated, he might direct the work of the shop, although the latter might have a foreman also. At any rate it is the service manager to whom we must look as the point of contact with customers. The question then arises, what qualifications must the ideal service manager have?

The question is not hard to answer if we bear in mind the fact that there is nothing mysterious about the selling of service. The same fundamentals apply in the selling of service as in selling any other commodity. Bearing in mind that we are talking about passenger car service, the ideal service manager will be an individual patterned about as follows:



Contrast the neat and businesslike appearance of the service manager above with that of the mechanic below. When an owner brings his car in it is not hard to see which of the two, coming to meet him, he would have the most confidence in



The Ideal Service Manager

He will be neat in appearance. This is the first requisite. The customer's first impression will be formed the minute he sees the service manager and therefore, the latter must put up the proper appearance to not only make a suitable and lasting impression, but give dignity to the whole place. The ideal service manager will come to work with his shoes shined every morning. He will wear a clean collar and neat tie. He need not allow himself to go about unshaven, nor will he wear a hat or cap when inside the building and meeting customers. He should not smoke during working hours.

A man of the above type is pretty sure to want his surroundings to be of the same high standards as his personal appearance. He will not tolerate a dirty floor, grimy work benches, unwashed windows, piles of rubbish, etc. He will make sure that tools and equipment used on the service floor and shop are kept in convenient places. He will have systematized the work so that every department will function without constant supervision. He will be a close student of human nature and study the peculiarities of the men in the shop. This last is very essential because it is he who will be looked up to smooth out any friction that might exist between the men. He will be a diplomat above all things.

The ideal service manager will see that his men are attired neatly. It is not expected that mechanics in the shop must come to work with a linen collar on, but the men who come in contact with the customer's cars on the service floor certainly ought to be presentable. The service manager will arrange so that the suits or linen dusters of the men are changed, say twice a week.

The ideal service manager will make sure that the house policy is right. Before he can go about his work and sell service as it ought to be sold he must make sure that what he has to sell is beyond criticism. He will, above all, want to see his customers get a square deal all the time. Before he can sell the policies laid down by the house he must be a firm believer in them himself. He will believe in his organization. He must consider it better equipped and shaped to give service than any other similar institution. Regarding repair work on cars he will see to it that there is a definite plan on which to base his calculations; in other words, a flat rate or maximum estimate plan. Having thus a concrete proposition to sell will make it much easier for him to sell customers.

Coming down to the actual selling of service the ideal service manager, if he has the above mentioned ground on which to work, should confine himself only with the selling of the work. He need not do any of the work himself, nor is he expected to do so. He will act largely like the floor walker in a department store. His job is to meet and direct customers in a courteous and friendly manner. He cannot leave his station and do any of the actual work, because to do so would leave no one to meet some other customer who might just be coming in. The ideal service manager will see that every time a customer comes in he will get prompt attention and get it every time.

Telling the Truth

The ideal service manager must not be afraid to tell the truth and thoroughly get the customers sold on the fact that no service station, big or little, can do the impossible. When a customer orders enough work to be done that will consume a total of six hours and wants the car in three hours, it is up to the service manager to avoid disappointment by either getting more time on the job or arranging for only part of the work to be done, the remainder to be finished at another time when convenient for the customer to leave the car. All this requires diplomacy and the ideal service manager will see that the customer in an instance like this is made to feel that he is personally being looked after.

Equally important is the question of the service manager remaining calm and patient under heavy pressure. Very often car owners are indefinite as to what they think ought to be done on the car, and in such a case the service manager must patiently work with the owner to ascertain in just what condition he would like his car to be after the work has been done. In this way it will not be difficult for him to have a mechanic make an examination of the car and estimate as to the cost.

Thus, before any work is started, all parties know about the case and there will be no squabbling about the bill afterwards.

A SERVICE STATION ON WHEELS

Novel Truck Makes Possible Caring for Stranded Customers

The traveling service station built by Jesse M. Bohler, service manager of Black & Maffet, Atlanta, Ga. Below is the steel-bound box which carries the parts most frequently needed

JESSE M. BOHLER, manager of the service station of Black & Maffett, Atlanta, Ga., distributors of Dodge Brothers cars, has built a complete traveling service station that is quite unique in the annals of the automobile business. He used a Dodge Brothers chassis and a truck attachment, together with an ordinary truck body as indicated in the photograph. Mounted on this truck directly below the printed word, "Service," is a steel bound, waterproof box which contains more than $250 worth of parts most frequently required in rush repair work. A skilled mechanic and an assistant, the latter acting as driver, travel with this truck, which is always at the beck and call of Dodge Brothers owners living in Atlanta.

In most cases the car can be repaired on the spot, for the mechanic carries along his own tools and has almost any part at hand that may be required. If it is impossible to make the necessary repairs on the spot, there is a hoist on the traveling service station to which the car can be attached and brought in to the regular station. It is seldom necessary, however, to tow a car in, for the traveling station has ample facilities for making almost any minor repairs or replacements right on the spot.

Mr. Bohler, forty-two years of age, is a mechanic by trade, having followed steam and electrical engineering for a number of years before he went into the automobile business. He was the service manager for the Pegram Motor Co., of Atlanta, in 1915, this company being the first to handle the Dodge Brothers car in the Southeastern territory. And, by the way, to Mr. Bohler belongs the honor of unloading the first Dodge car that was sold in the state of Georgia. When J. W. Goldsmith, Jr., took over the Dodge agency in Atlanta, Mr. Bohler went with this company, later establishing a business of his own specializing in the repair and upkeep of the Dodge.

When his business was entirely destroyed by fire a year and a half later he accepted the offer of Black and Maffett, who in the meantime had acquired the Dodge agency, to manage their service station and that is the position he holds today. Virtually the entire system in vogue in this station was personally originated by Mr. Bohler himself, who is as much of a business man as he is a mechanic.

Mr. Bohler believes that system is one of the contributing factors to success in any line of business. System eliminates waste effort; it eliminates loss of time; it enables the business man to keep his hand upon the pulse of his business every hour of the day, and to know just what each of his employees is doing; it enables him to know definitely just what progress his business is making, and only through the inauguration of the right kind of a system can any business ever hope to attain the pinnacle of one hundred per cent efficiency.

Now as regards Mr. Bohler's system of keeping the records of the business, let us take the car in need of repairs from the time it drives up at the service station until it is returned to the owner a completed job.

Either Mr. Bohler himself or his assistant, R. M. Tuck, who is also a skilled mechanic, talks with the customer and looks over the car. Whatever repairs are requested or authorized by the customer are written down on a ticket provided for that purpose. This ticket is illustrated in Fig. 1.

Then there is another ticket that is divided into three parts, perforated so that each part may be separated as required. This ticket is illustrated in Fig. 2. It will

The Forms Used in the Service Department of Black & Maffet and Described on the Opposite Page

1

AUTHORITY FOR REPAIRS

BLACK & MAFFETT

Job No.

Date

License No.

Owner

Address

Date Wanted

Phone

Mileage

Please make the following repairs:

I authorize the above work and any further minor repairs necessary, for which I agree to pay on completion.

Signed:

For Owner

3

No 4248

WEAVER, B. F.

Stop leak at water pump.

Adjust valves.

Adjust foot brakes.

Install two adjusting studs in foot brake.

Time Wanted -- At Once.

THE ABOVE WORK HAS BEEN SATISFACTORILY DONE Jackson MECHANIC

2

BLACK & MAFFETT

This tag must remain on car while in the garage. When car is taken out it must be detached and returned to office with release check.

JOB No 4248

Name

Date

Subject to conditions on back of this coupon.

JOB No 4248

RELEASE CHECK

Name

Address

License No.

State

BLACK & MAFFETT

JOB No 4248

License No.

Name

Subject to conditions on back of this coupon.
This Check Must Be Presented at Office to Obtain Car.
ALL WORK IS CASH ON DELIVERY
We Do Not Keep Books

4

TIME CARD

Workman No. Name of Workman

Job No. Date

Work Done

Time Started Time Stopped Total Time on This Job Hrs.

Remarks and Suggestions on Other Side

5

BLACK AND MAFFETT

ATLANTA, GA.

THIS SIDE OF CARD IS FOR ADDRESS ONLY

1 CENT STAMP

ATLANTA, GA.

On this date our records show your Dodge Brothers Motor Car was in our Repair Department for attention.

Won't you please fill out the attached card and return it to us at once if you have any criticism to make as to the quality of the work or as to the treatment you received by our employees.

We are earnestly endeavoring to improve the quality of service this Company extends to its patrons and we can best accomplish this by learning direct from our patrons wherein this service does not satisfy.

Yours very truly,

BLACK & MAFFETT.

be noted that all three sections of Fig. 2 contain the job number, and this number is written on the ticket, Fig. 1, in the space provided therefor. The upper part of the ticket, Fig. 2, is torn off and tied on the radiator of the car. The lower part is returned to the customer, who presents it when he comes after his car. The center part is kept on file in the office of the station until the job is finished. The ticket, Fig. 1, is then turned over to a stenographer, who makes out on the typewriter another job ticket as illustrated in Fig. 3. This is the ticket that is turned over to the foreman in the shop.

As will be noted this ticket also contains the job number, which corresponds to that portion of the other ticket, Fig. 2, that was tied to the radiator of the car. The original ticket, Fig. 1, is placed on file after it has been copied by the stenographer.

Selecting the Right Mechanics

The foreman then looks over the car and selects that mechanic from among the twenty-four that are employed in this station, whom he thinks is best qualified to do this particular job. The ticket, Fig. 3, is then turned over by the foreman to the mechanic who is to do the work.

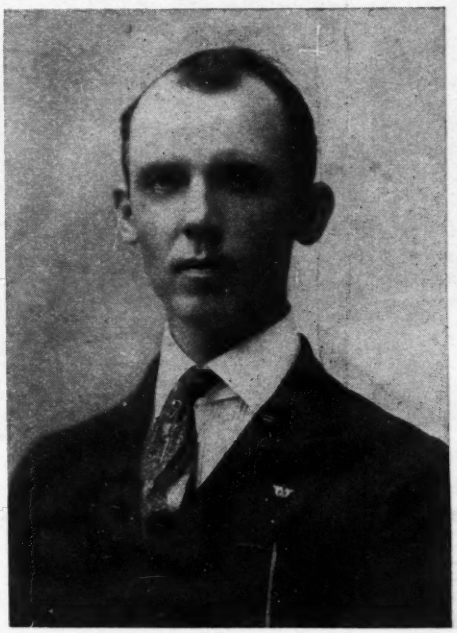
The mechanic then makes the necessary repairs, filling out the time card illustrated by Fig. 4, when he has completed the work. On this card he writes his own time clock number and also the number of the job. Then if he finds it necessary to make any other adjustments or repairs not mentioned on the job ticket he states on the back of the time card what additional work he has done, or suggests any work that ought to be done on that particular car. Each card also tells the total time devoted to each job, entered thereon by the mechanic.

By way of illustrating this point the job ticket may call for an adjustment of the brakes, but when the mechanic gets to work he finds that the brakes really needed relining. He carries out the work according to the ticket and writes on the back of the time card that the brakes need relining. Then when the customer receives his bill it is stated thereon that the best job possible was done under the circumstances, but that the brakes really needed to be relined. Therefore if the brakes still give trouble the customer knows that it is not because of defective workmanship at the service station. Furthermore the notation on the bill enables Mr. Bohler to more satisfactorily adjust the matter should the customer bring the car back and declare that the work had not been satisfactory.

When the job has been entirely completed the foreman inspects it and writes his O.K. on the job ticket, returning that and the workman's time card to the office where both are kept on file—the ticket under the name of the customer, and the time card under the number of the workman.

The bill that is presented to the customer when he calls for his car contains the number of that particular job

Jesse M. Bohler, Combination Business Man and Mechanic Who Has Built Efficient Service



and the number of the workman. Therefore if any car is brought back to the station and the customer declares the work unsatisfactory, it takes but a moment for Mr. Bohler to find out just what mechanic did the work on that car. He looks up the name of the customer among his duplicate bills, and thereon finds the job number and the workman's number. He then looks up the job ticket and the mechanic's time card. If it is learned that the work really was poorly done then the manager has two employees on whom he may fix the blame—the foreman or his assistant who put their O.K. on the job ticket, and the mechanic who handled the job.

Mechanics Are Careful

The system is so thoroughly efficient that mechanics employed by Black and Maffett are always careful to do their work as it should be done, and the foreman or his assistant are careful not to O.K. any work that is in the least defective. It is very seldom indeed that cars are ever brought back to this station because of defective workmanship.

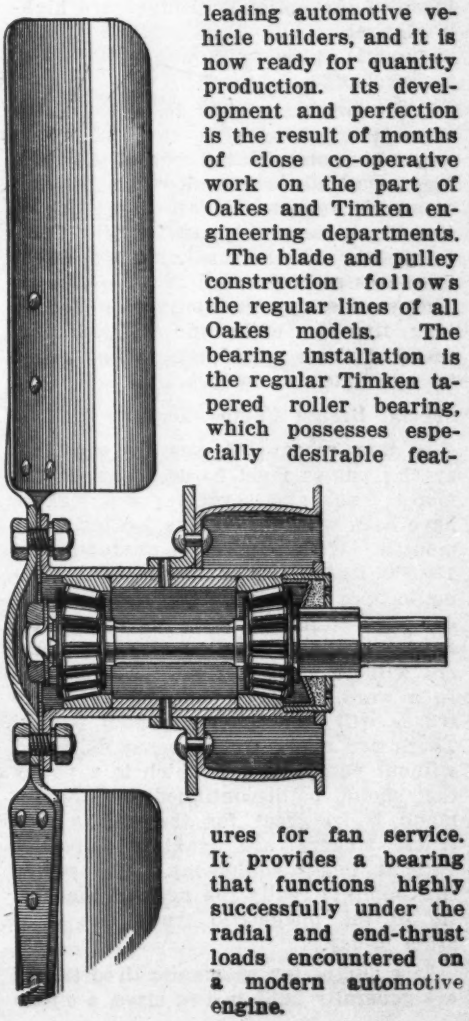
In the office at the station there is a large blackboard and the number of every repair job brought into the station is written on this board. Opposite this is written the time when the car is to be ready for the customer. If no particular time is stated by the customer this notation will be, "As soon as possible." If it is desired, say, by the following Tuesday, that day of the week will be written after the job number. If it is a rush job, then the single word "Rush" is written. When the job is completed the time to go is erased and the word, "Ready," written opposite that particular job number. This enables the manager to know at all times at a single glance, just what work is on hand and when it must be ready for delivery. By looking up the job number in his files he can find what mechanic is on that work, and thus learn just when the car will be ready for delivery.

Interest in the Work Done

Every week a postal card is sent to all customers who have had cars in the station for repair during the past week. On one side of this card, which is a folding card and detachable, is a brief note to the customer asking him to fill out the questions on the attached portion and drop it in the nearest mailbox. As the card is already stamped and addressed, this requires but very little trouble on the part of the customer, and most of the cards sent out are returned. This card is illustrated in Fig. 5. It is the final word in a service that is indeed efficient, and a system that could not possibly be more thorough.

Oakes Roller Bearing Radiator Fan

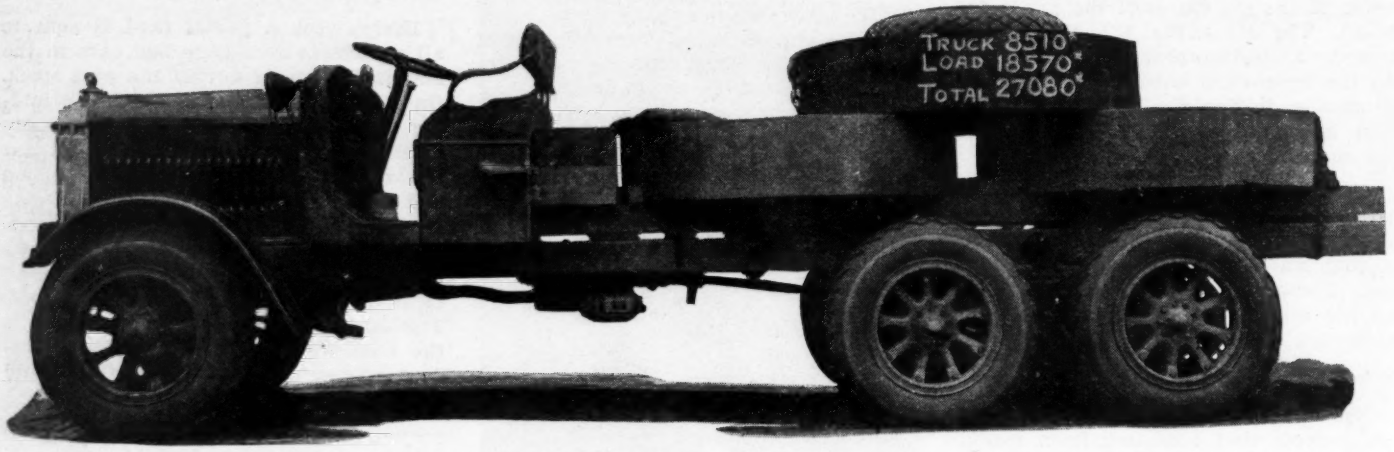
THE Oakes Co. of Indianapolis, builders of radiator cooling fans for cars, trucks and tractors, has just announced a new model Oakes fan in which Timken bearings are used as standard equipment. This new model has already been selected by several leading automotive vehicle builders, and it is now ready for quantity production. Its development and perfection is the result of months of close co-operative work on the part of Oakes and Timken engineering departments.



The blade and pulley construction follows the regular lines of all Oakes models. The bearing installation is the regular Timken tapered roller bearing, which possesses especially desirable features for fan service. It provides a bearing that functions highly successfully under the radial and end-thrust loads encountered on a modern automotive engine.

The Pneumatic Truck Tire

Mechanical Changes Made Necessary in Trucks By Application of the Pneumatic Tire



The six-wheel truck developed by the Goodyear Co. is one interesting phase of the situation. This truck is an answer to the other side of the question concerning the overly large truck tire. The load on this truck is over nine tons

BY DAVID BEECROFT
Directing Editor, The Class Journal Co.

Note—This is Part Two of the series on pneumatic tires for motor trucks and has to do with changes in connection with the truck and the many other relative problems.

EQUIPPING a motor truck with pneumatic tires calls for certain changes in the truck chassis. These changes are two-fold. There are some that are essential and others that are optional. Some of the optional changes are highly desirable, but it is possible to use pneumatic tires without resorting to these changes.

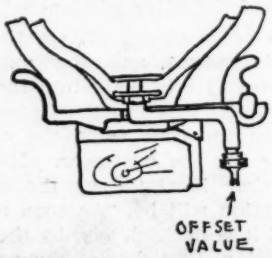
One of what might be described as the imperative changes is that of fitting power air pump for inflation of the tires. The small air pump fitted to touring cars and capable of inflating to 90 lb. or 100 lb., is not adequate for the Giant pneumatic on the motor truck where pressures reach as high as 130 or 140 lb. The smaller pump would require too long time to make the inflation and some of them would not in any sense be adequate to the job.

Special Design Pumps Needed

It was recognized months ago that special pumps must be designed for the motor truck and several pump makers have been working on this job for many months. With a possible production of 130,000 motor trucks fitted with pneumatic tires to be made during the calendar year of 1920, it does not appear today as if the production of pump makers will go much beyond 75,000 pumps. In a word, many of the small capacity trucks will be delivered without pumps. There are many trucks being delivered without pumps to-day which is a policy that should be discontinued, but the demand is so great for the trucks that truck makers are making deliveries without pump equipment. The power tire pump is really the neck of the bottle in the pneumatic truck tire situation to-day.

Tire pumps for pneumatic tired trucks are generally built in two sizes, a single cylinder pump for tires, 6, 7 and 8 in. in diameter; and a two-cylinder design for larger tires, say 8, 9 and 10 in. in diameter. The service on these pumps is very severe, due to the heat created. So great is the heat that it has been necessary to treat the iron castings forming the pump cylinder in order to prevent the cylinder losing its shape due to heat. Some tire makers have recommended a length of copper tubing leading from the pump and connecting with the rubber tube that carries the air to the tire. The copper pipe is necessary to radiate the heat before it reaches the rubber tube, which would not stand the high temperatures.

It is not possible to give definite time required for inflating different sizes of pneumatic tires, but the following figures have been attested to by some pump manufacturers and will give a general conception of the time needed.



The offset valve used on the large tires. With this type of valve it is not necessary to lift the heavy tire when placing it on the wheel. The tire is slid on the rim

A single cylinder pump is expected to inflate tires as follows:

36 x 6-in. tire inflated in 5 min. Pressure 90 lb.

38 x 7-in. tire inflated in 8-9 min. Pressure 100 lb.

40 x 8-in. tire inflated in 11-12 min. Pressure 110 lb.

With a 2-cylinder pump inflation will require approximately as follows:

40 x 8-in. tire inflated in 5 min. Pressure 110 lb.

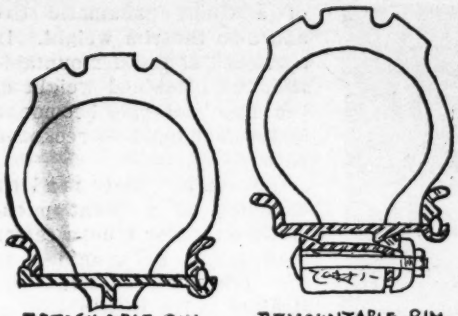
42 x 9-in. tire inflated in 7½ min. Pressure 120 lb.

44 x 10-in. tire inflated in 10 min. Pressure 130 lb.

These figures mean inflating a tire from the flat or empty condition. A much shorter time would be needed to check up the tires each evening in the garage. Owing to the cost of Giant pneumatic tires it is imperative that the air pressure be checked up as regularly as filling with gasoline, oil or water is followed.

Tire Valves Too Small

At present the neck of the bottle in inflating Giant pneumatic tires is the size of the valve. This is one respect in which development has fallen a little behind, namely, in that the opening diameter in the valve is not great enough for the cubic capacity of the tire. This is equivalent to requiring too much time to inflate. It must be borne in mind that if 10 min. should be needed to bring up to correct inflation each tire on a truck, that would mean 40 min. for the truck. This would be a serious situation where the value of a truck is reckoned



Showing the two types of rims that have been developed for the large tires

at so much per hour. Should a fleet owner with 25 or 30 trucks fitted with pneumatic tires have to spend a similar amount of time it can be quickly calculated what the cost would be. This calls for arrangements in the garage whereby all pneumatic tires should be checked up at night.

The power tire pump on the motor truck is driven from the gearbox rather than from the engine for the reason that the power required for driving it would impose too much of a strain on the layshaft of an engine. Manufacturers of motor pumps agreed, June, 1919, to standardize the method of driving pumps from the gearbox and mounting them on the gearbox. This standardization means that any one of several different makes of pumps can be fitted to the same gearbox. It means further that the manufacturers of gearboxes have left an opening in the side of the case which is standard in size, permitting of mounting thereon any of the several makes of pumps.

Kellogg was the leader in the development of the pump for motor trucks and it was the Kellogg method of mounting and drive that was accepted by the Society of Automotive Engineers, and which exists as the standard of to-day. In addition to Kellogg there are upwards of ten pump makers who have been developing pumps and some of whom are in production of 50 to 100 per day. Others are not through with the experimental work and will not be in production for some time.

Another change that has come about by virtue of the pneumatic tire for trucks is the requirement for a complete new line of jacks for lifting the wheels from the ground. While these jacks do not affect the truck design, they are almost as essential to the pneumatic tire as the power pump.

The work for a jack for pneumatic tired trucks is different than that for solid tired trucks in that a jack must have a greater range of lift for the pneumatic tire. With the 8, 9 and 10-in. sizes, the axle is let down and raised more in case of tire trouble than with solids.

Then there are three most important measurements that the jack for pneumatic tired trucks must meet:

1—The minimum fixed type of the jack when closed and ready to be fitted under the axle should not be over 9½ in.

2—It should have a maximum lifting range of 12½ in. That is, it should permit of elevating the axle approximately this amount.

3—Its height when raised to the limit should be not less than 22 in.

These figures lie outside of the range of the jack intended for solid tired trucks and call for practically a new design of jack and the dozen or more jack manufacturers have for many months been very active in developing new jacks for this trade, with the result that there will not be any shortage of successful designs.

The prices of these new jacks will be approximately the same as those of jacks suitable for solid tires.

Three Types of Jacks

Approximately three different sizes of jacks are expected to care for the complete range of truck capacity is as follows:

What might be designated as 1-ton jack for trucks up to 2000 lb. capacity.

What might be designated a 3-ton jack for 2-3 ton capacity.

What might be designated as a 5-ton jack for trucks of 4-7 ton capacity.

Without doubt a great deal of ingenuity will be displayed in these new jacks, many of which are on the market. There will be more use for a jack on pneumatic tired trucks than on solid tired jobs, due to attention the tires will have to receive on the road. This makes it necessary to have a jack that will readily elevate the truck wheel while the truck is loaded and one man will have to do the work.

Among the new ideas are telescoping handles that afford good leverage and cut down the arm work needed. There are some types, which, by reversing the handle will raise or lower the jack, thus eliminating the necessity of the operator getting underneath the truck to work the reverse ratchet. Some jacks have horizontal handle movement, thus affording an uninterrupted field of movement. Others are operated by chain and there is scarcely any end to versatility of design.

The pneumatic tire calls for a complete new wheel as compared with the solid, and in this regard a great deal of development by makers of metal and wood wheels have taken place and much yet remains to be done. The output of pneumatic tired trucks is not being held up, due to any shortage of wheels. The cost of wheels for pneumatics will not be any greater than that of wheels for solids and probably a little less. In the case of metal wheels, that for pneumatics is lighter than that for solids, and where these are purchased on a pound basis the cost to the truck maker should be less than that for solids.

It is always desirable to reduce the unsprung weight in a motor truck as well as the unsprung weight of a motor car and the economy of weight of a metal wheel for the pneumatic is a very desirable thing. Here are a few examples of how weight is being reduced:

A heavy load and a bad road does not prove a serious obstacle for the pneumatic tire

The West Steel Castings Co., one of the several manufacturers of metal wheels, has given the following figures on a 3-ton Packard truck for pneumatic tires, as compared with the weight of a set of four wheels for solid tires. Here are the figures:

Four wheels for pneumatic tires .....432 lb.
Four wheels for solid tires.....700 lb.

Here is a reduction of 268 lb. or approximately 67 lb. per wheel.

This concern has given a further example of weight reduction for a 2-ton truck taking Timken axles. The figures are:

Four wheels for pneumatic tires .....362 lb.
Four wheels for solid tires.....432 lb.

Here the reduction of weight is not so great as in the larger model.

There are to-day a dozen or more concerns manufacturing metal wheels for pneumatic tires on trucks and an equal number in the wood wheel field. All of these manufacturers have not completed direct experimental work, whereas others are in production. The wood wheel manufacturers have had an engineer carrying on a great deal of research work for some time, and in addition each concern has generally been

doing development work of its own.

A desirable feature in the wheel situation for pneumatic tires is that practically one diameter of wheel has been agreed upon. This wheel without tire or rim is 24 in. in diameter. This diameter is adhered to irrespective of whether the tire is 40 by 8, 42 by 9 or 44 by 10 in. It is also adhered to for the smaller sizes. To the tire makers must go much of the credit for deciding upon one diameter of wheel. In the solid tire field there has been for years continuous effort towards reducing the number of wheel diameters, but not enough progress has been made and it augurs well for standardization in the pneumatic tired truck that one wheel diameter has been agreed upon.

Firestone has done much to advance the cause of the pneumatic truck tire. This is a 40 by 8 in. tire equipped with the offset valve

The following tabulation shows the different overall diameters of wheel with tire mounted when the 24 in. wheel is fitted with different sized tires:

Wheel diameter	Tire size	Over-all diameter
24 in.	36 x 6	36 in.
24 in.	38 x 7	38 in.
24 in.	40 x 8	40 in.
24 in.	42 x 9	42 in.
24 in.	44 x 10	44 in.

From these figures you will recognize that the pneumatic tire owing to its great tube diameter calls for more vertical space at the side of a truck than a solid tire. This is particularly true when the larger sizes are used. For example, when fitting pneumatic tires on a motor bus, more space is consumed for accommodating the upper part of the wheel than with a solid tire. The height of the vehicle is increased slightly.

Two Rims Styles at Present

At present wheels for pneumatic tired trucks are being manufactured in two styles, one to take demountable rims and the other to take quick detachable rims. The demountable rim is similar to that used on a passenger motor car, but proportionately larger. The demountable rim may have what is known as a Q-D ring to permit of easy removal of the tire from the rim.

The Q-D wheel, meaning quick detachable, has Q-D ring on one side and a permanent flange on the opposite side of the wheel. It has the advantage of reducing the weight of the wheel as compared with when the demountable rim is used.

At present the popular demand is for the demountable rim, but it is questionable if in the long run the Q-D type will not prove more desirable. It is possible for one man to change one of the largest sizes of Giant pneumatics with a Q-D ring without any serious trouble. Satisfactory tools to make such changes possible exist to-day and undoubtedly improved ones will be brought out as the use of the pneumatic extends. The question of reduced weight and the carrying of spares is the problem to be considered. It requires a good deal of space to carry a 40 by 10 spare, and the weight of this is increased with the demountable rim. Should a puncture occur on the road it will be necessary for the driver to remove the tire from the rim. The work in doing this on a demountable rim is practically the same as doing it with a Q-D on a wheel which has not the demountable rim feature.

The following table of weights will perhaps broaden the view of this question. This table is not complete and the figures are those applying to Goodyear tires:

Tire size	Rim weight	Tire weight
36 x 6	87.8 lb.	73 lb.
38 x 7	97.9 lb.	87.9 lb.
40 x 7	126.8 lb.	119.9 lb.
42 x 9	.....	174.9 lb.
44 x 10	.....	247 lb.

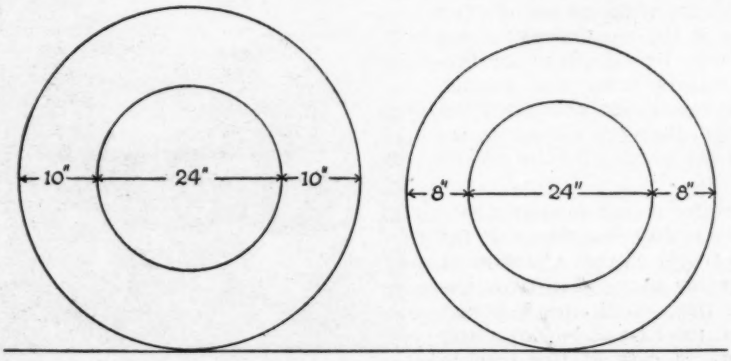
These figures indicate the great weight of a Giant pneumatic tire and also the rim weight. In a change of the demountable rim, the combined weight of the tire and rim become a factor that must be reckoned with.

One thing that makes changing of a Giant pneumatic on motor trucks easier than might be imagined, is the offset valve, or the straight valve with a slot in the felloe. On the passenger automobile the valve stem passes radially through the wheel felloe, and in removing a demountable rim with tire, the heaviest work is in lifting the tire high enough so as to remove the long valve stem from the hole through the felloe. This is all eliminated in the Giant pneumatic. The valve has an elbow in it something like the right angled elbow in a stove pipe, in fact it has two of these elbows. This allows of slipping the demountable rim with tire over the wheel without any unnecessary lifting. The same is true in slipping the tire in place on a Q-D wheel construction.

Valve Standardization

All valves are not of this particular design. In some cases slots are cut in the wheel felloe to accommodate the valve with the slot in the felloe, the removal of a tire and demountable rim is as easily done with one type of valve as with the other. Complete standardization has not as yet been accomplished in this matter of valve design. Wheel and tire manufacturers are engaged in solving it. It is to be hoped that all will agree on one standard design. The development of a larger diameter valve than is manufactured at present so as to allow of quicker inflation of the tire is very much desired.

There are many other problems that the wheel makers have ahead of them. One of the reasons that truck wheels are expensive is that different truck makers have different axle designs which call for different hub construction on the wheels. The ideal condition will be when axle ends are more standardized



All truck tires have been standardized, to the extent that the inside diameter is the same. A 12 in. tire will have the same inside diameter as an 8 in. tire, 24 in.

than at present, so that it will not be necessary for the wheel makers to have 80 or 100 different designs of hub constructions to meet the requirements of different trucks. The wheel makers would welcome such a standardization that would admit of the same wheel being used on any one of two dozen different makes of 2-ton trucks, and they are working with that object in mind.

Reducing Truck Weight

There are a great many other aspects in which the truck chassis may have to be altered and probably will be altered before the ideal truck designed for pneumatic tires is a reality. Over a year ago a competent engineer, speaking of the pneumatic tired truck, made the statement that the truck of the future would be designed more along the lines of the passenger automobile than along the lines of the motor truck. He had in mind the possibility of reducing weight throughout the truck as it can be reduced for pneumatic tires. When you eliminate a large portion of vibration that comes from solid tires you make it possible to reduce the weight of the truck parts.

Again quoting from the experience of Goodyear, which is not in the truck manufacturing field, but which has an engineering department working on the development of trucks for pneumatic tires, we get some figures which indicate what the future may have in store. When Goodyear started originally with its pneumatic tires on trucks, the truck with body complete, weighed 15,800 lb. and carried a pay load of 3850 lb. Roughly speaking, here was a complete vehicle weighing 8-ton, which carried a 2-ton useful load. By reducing weight, Goodyear now has a truck which, complete, weighs 8000 lb. and carries a useful load of 7000 lb. Within the last month a large truck maker has brought out a new 3-ton truck that weighs 5900 lb. This is an indication of what future weight reductions can be made as compared with weights for solid tired trucks.

Herein lies one of the great possibilities of the pneumatic tired truck, namely, bringing the ratio of useful load as compared with the total weight of the truck up to a more favorable basis. Whenever this is done the cost of transportation by such a vehicle is reduced.

It is impossible to give definite figures as to what can be accomplished in weight reduction in actual manufacturing practice. The truck manufacturers have not had the matter under hand long enough to have definite figures available. Here it might be stated that truck makers have been slower than the tire makers in embracing the Giant pneumatic tire. It has been up to the tire makers to sell the truck makers and not the case of a truck maker going to the tire maker and demanding that he develop a pneumatic for trucks. The attitude of the truck maker seems to be one of not looking with any pleasure on the job, or perhaps eventually discarding existing models intended for solid tires and going through the long process of engineering development of a truck for pneumatics. Not only has the truck manufacturer been slow in attacking the problem, but the manufacturers of truck components, such as engines, gearsets, axles, etc., has been equally reticent.

It is not definite yet what changes will be made in the engine, gearset and axles of a truck for pneumatic tires. What has been done to-day is largely development. It is experimental. With not a few companies it is more talk than research. Some engineers understand how the whole thing should be done, but have not done anything. It is a pretty difficult time in which to blaze out the real trail and what follows on this subject is more or less experimental and the future must be watched. The following paragraphs are intended to narrate an analysis of the problem, rather than to record how it is to be done.

The question of the gearset needed for the pneumatic is one on which each gearset manufacturer has a different explanation. Each truck maker has a different view on it. The general agreement is that more forward speed changes are needed in a truck for pneumatics than a corresponding truck for solids. If the solid truck has a four-speed gearset, five, six or seven speeds may be needed for the pneumatic, according to conditions. If this is not done a larger engine will be needed. The following explanation may serve to clarify the interrelationship of engine and gearbox in producing the higher speeds and greater acceleration of the pneumatic tire truck.

It requires more engine power to get a 3-ton truck with its load from a standstill to 20 m.p.h. in the length of a city block, than it does to get that same truck on solid tires from a standstill to 12 m.p.h. in the same city block. It is simply a case of more work to be done in getting to 20 m.p.h. than getting to 12 m.p.h.

Bigger Engine or More Speed Changes

You can accomplish this in two ways: First, a bigger engine will do it. If you have not the bigger engine then you must make more gear changes and utilize the power of a smaller engine through this greater range of gear shifts.

In attempting to solve this question of how many speeds a gearbox on a pneumatic truck should give the industry is divided up in two fields:

1—The first field favors mounting two gearboxes on the truck and thereby securing six or eight forward speed changes. This is not so serious a problem as it appears at first thought. A conventional three or four-speed gearbox, mounted as a unit with the engine, can be used. The second gearbox is mounted midway between the engine and the back axle and is a simple design giving two speeds. There are two gearshift levers for the driver to handle and with these he gets six or eight forward speeds. Handling the two levers is not so much a problem as might be imagined.

2—The second field of design favors a single design of gearbox which will give five or seven speeds. There is no set place where it might be mounted, although midway between

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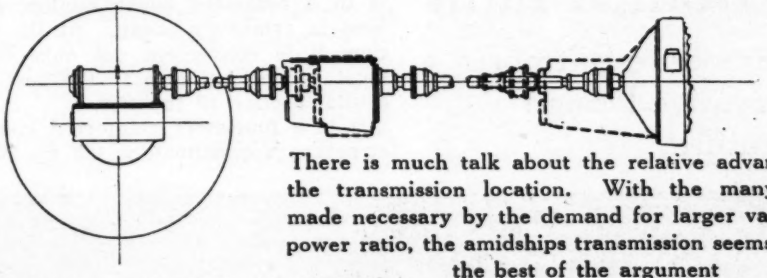
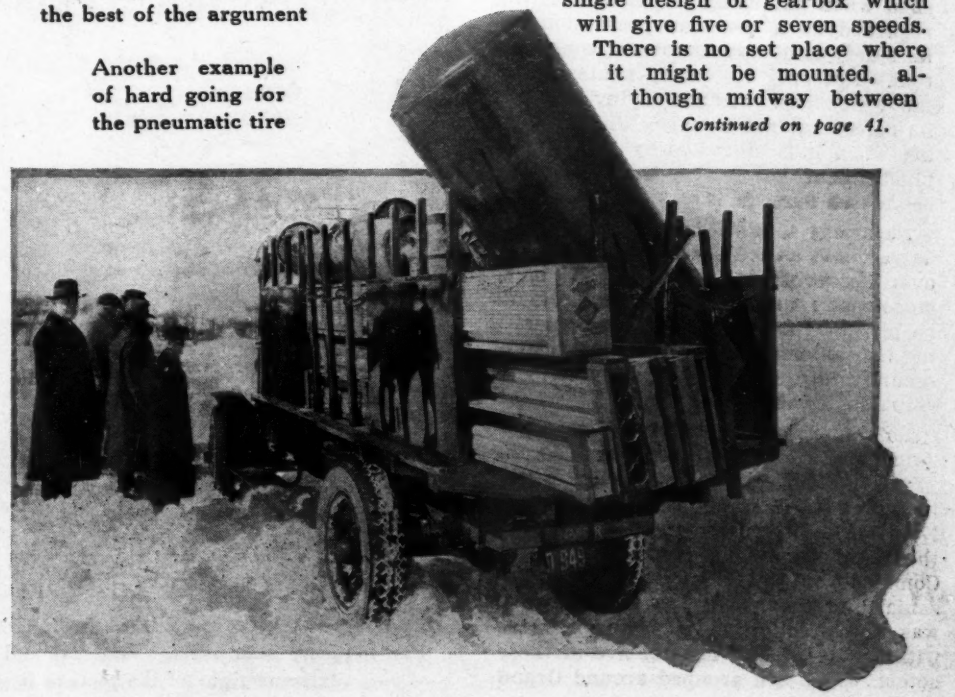
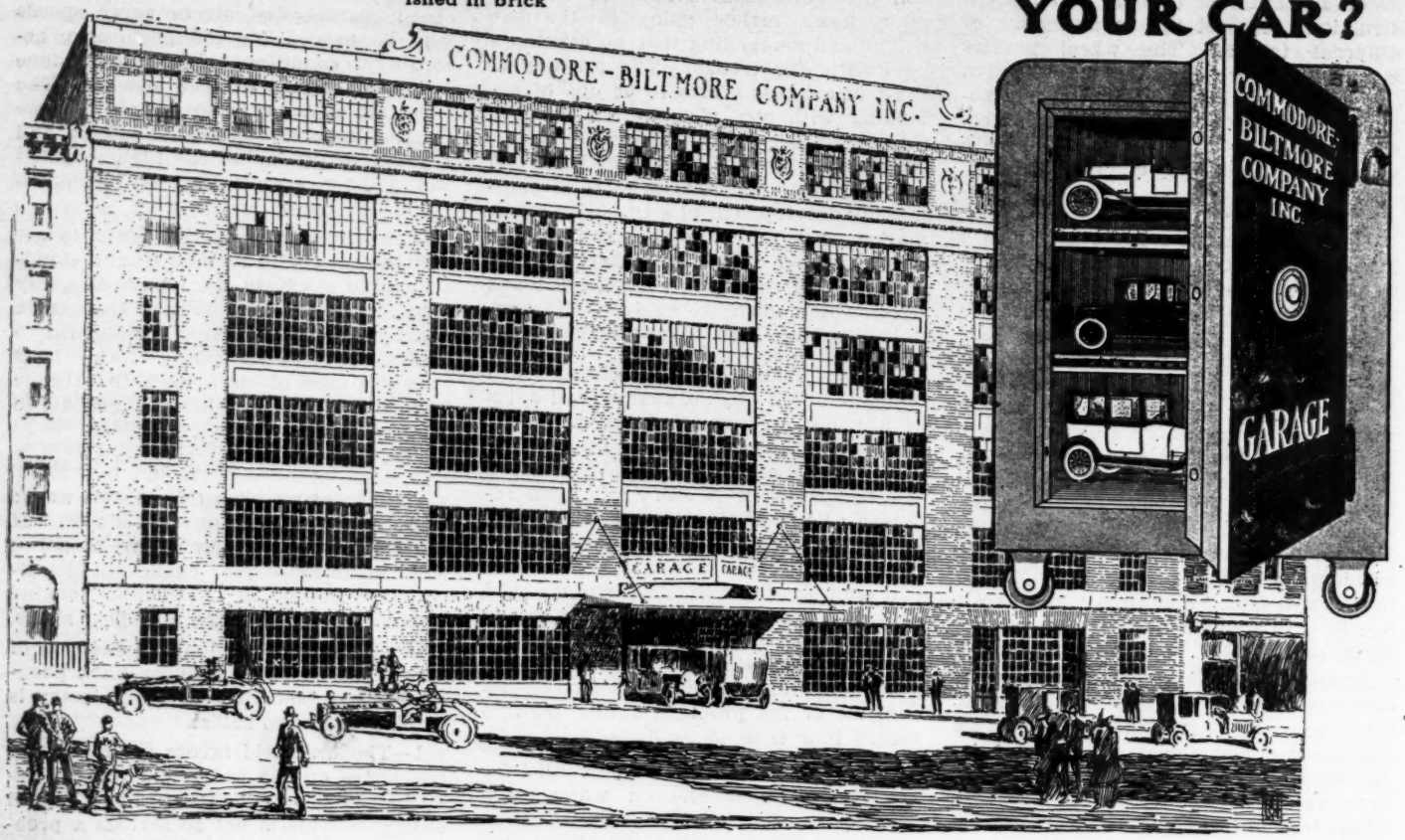


There is much talk about the relative advantages of the transmission location. With the many speeds made necessary by the demand for larger varieties in power ratio, the amidships transmission seems to have the best of the argument

Another example of hard going for the pneumatic tire



Exterior view of the 400-car Commodore-Biltmore Company, Inc., garage. The building is of concrete with the front finished in brick



HOW SAFE IS YOUR CAR?

Keeping Cars Safe from Harm

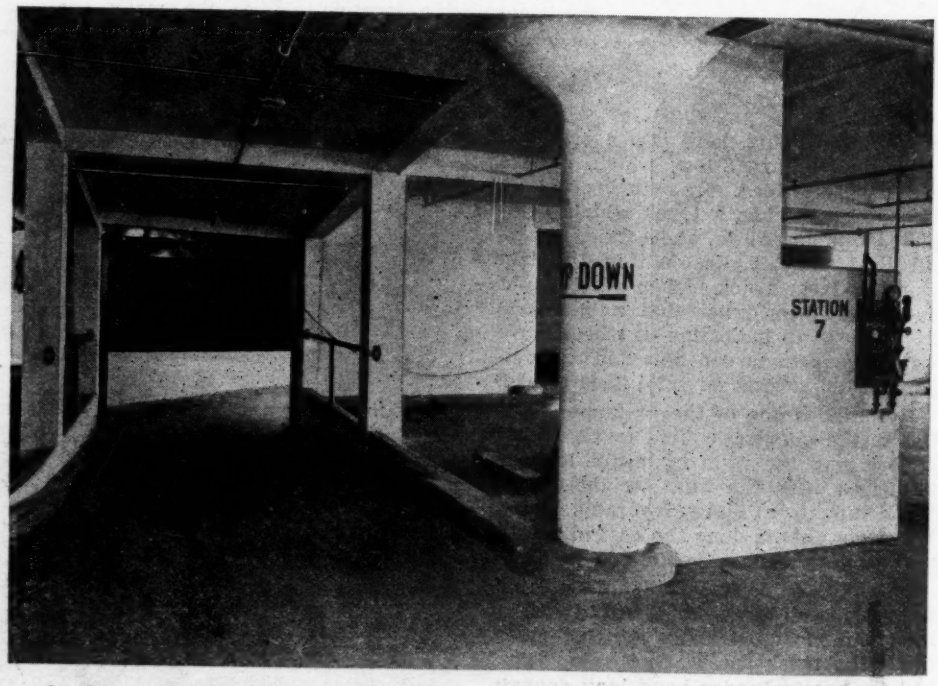
Protection of Cars In The Commodore-Biltmore Garage Is Secured by Conservative Design —Ramps Unique Feature

THE owner of a $10,000 necklace does not store it in a coal bin or a woodshed when not using it. It is naturally regarded as a precious possession and its safety is a very important consideration. Not only its safety against theft, the which goes without saying, but also its safety against damage. When not being worn it is stored away in a silk or plush lined box and placed where no harm can come to it.

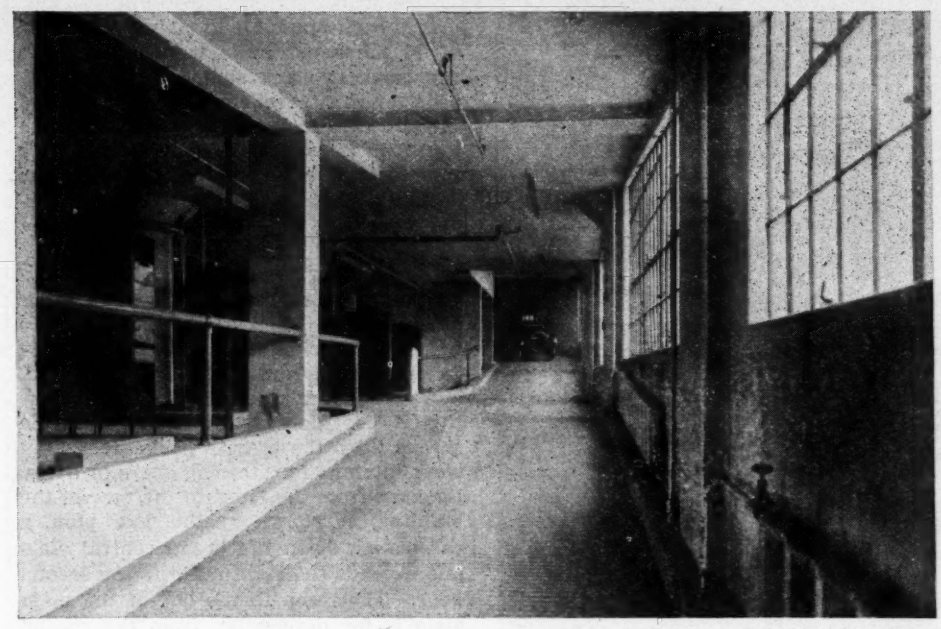
Naturally a $10,000 automobile is just as valuable as a $10,000 necklace. Moreover its worth and efficiency are much more easily impaired. Why should it not be possible to provide for the owner of the fine automobile the same measure of security that exists for the possessor of valuable jewelry?

This question arose in the mind of John McE. Bowman, president of the greatest string of hotels in the world, including six large and luxurious ones in New York City, namely: The Biltmore, the Manhattan, The Murray Hill; the Commodore; the Belmont; and the Ansonia, and the answer to that question was the erection of a 400-car garage within a scant half mile of five of these hotels, which are grouped around Grand Central Terminal. It is located on Forty-fourth street east of Second avenue and is in a tenement house section where land is relatively cheap. At the same time it is convenient not only to the hotel section but also to the best residential section of the city.

It is a four-story reinforced concrete structure approximately 160 by 200 ft.



Looking down the ramp from the fourth to the third floors. The camera location is in the main aisle. The rear end of the building is to the right. At the extreme right of the picture is gasoline filling station number 7



This is a splendid view of the ramps taken from about four-fifths of the way up the ramp running from the first to the second floor

The front facade, however, is finished in brick to give a more attractive appearance.

Outside of the ramp construction, which is unique, there is nothing radical in the garage design. Protection of cars against injury is simply secured by ultra-conservative design.

Most of the injuries that happen to cars while in garages come from collisions with other cars, with corners or post, or while entering or leaving the elevator, which in most garages is the only means of reaching the upper floors. In the Commodore-Biltmore Co.'s garage every effort was made to incorporate such features in the building design as would minimize or eliminate any chance of collision or contact.

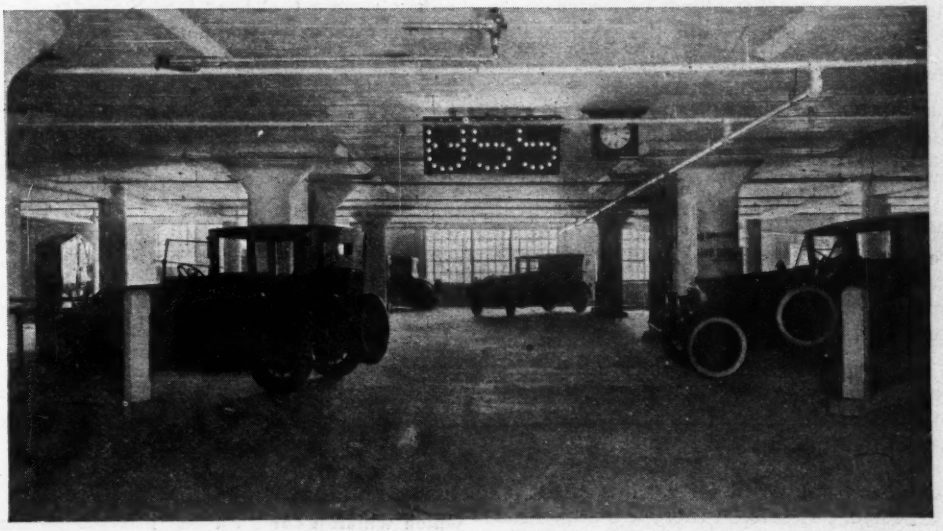
In the first place, two circular ramps lead from the ground to the top floor of the building, providing two independent roadways, one for ascending cars and the other for descending cars. There are no dangerous or angular turns. The grade is never more than 8 per cent and as the cars on either ramp are all running in the same direction it is impossible for two machines to meet head on. At the turn on each floor there is a space of 75 ft. between cars going out and cars coming in, and an unobstructed view.

The ramps are independent of each other, eliminating all delay in entering or leaving the garage. There is no waiting in line in the street for a chance to enter; on the other hand there is no delay in getting out of the building.

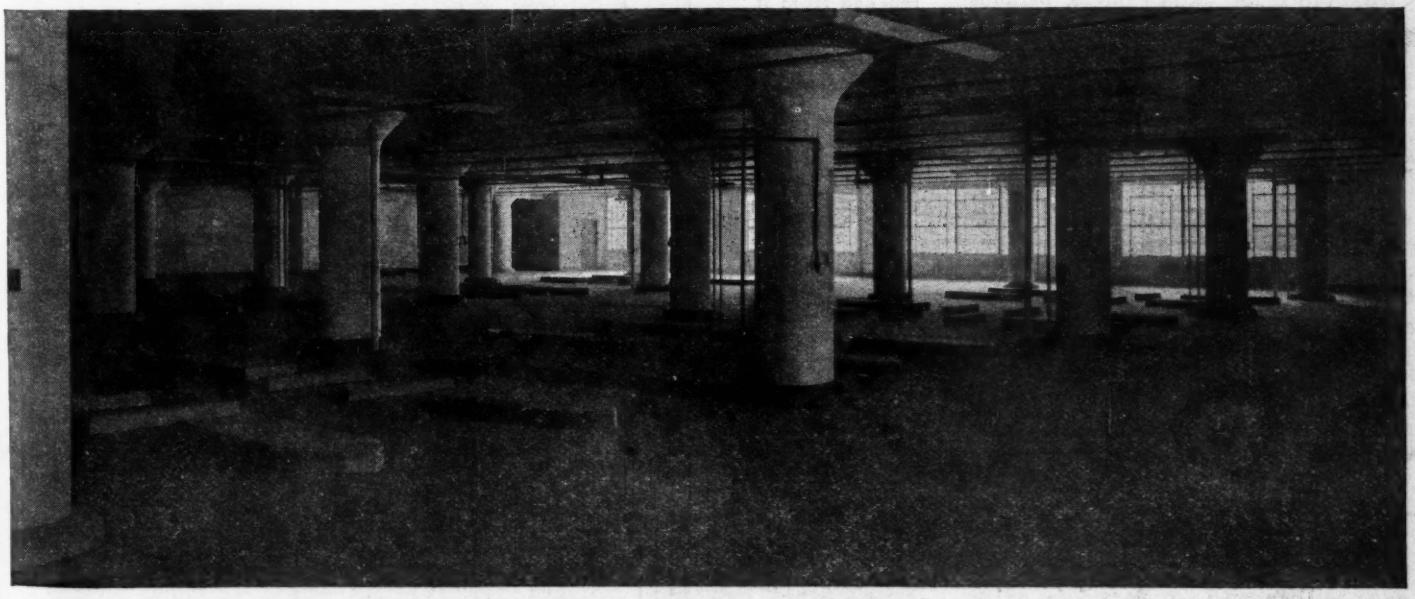
Broad car aisles contribute to car safety. There is plenty of room so that there is little or no temptation to cut close to cars parked along the aisles.

Broad windows front and rear supply ample light to all parts of the garage. This in itself is an important safety factor which is frequently overlooked.

With car security uppermost, particu-



Another view of the second floor down the main aisle toward the rear of the building. The electrical call sign is well illustrated in this picture



View of upper floor looking from a side aisle diagonally across the building toward the front. The arrangement of concrete guides is clearly shown. Three cars are parked between each two columns. Note width of the aisles

This picture clearly shows the large amount of space allowed between cars. Some chauffeurs object to the concrete guides, claiming that they tear the side-walls of the tires, but the photograph shows that there is sufficient clearance if reasonable care is taken in driving a car in or out

lar attention was given to the layout of the floors so that each car would be assured abundant space. The floor is marked out with concrete guides, each one numbered and so far from the next that it is impossible for two cars to be crowded together in such a way that they will come into contact. A concrete bumper at the rear prevents collision with cars behind.

Maneuvering of cars during washing and consequent risk of damage is practically eliminated by providing for the washing of cars directly in front of their spaces. To accomplish this the traveling overhead washer is not used as might be expected, but instead there are numerous rotary washers of the familiar type.

While special stress is laid on the security which the garage offers, perhaps as much or more emphasis should be placed on the ease and convenience which the building offers. The compressed air operated front doors, the gently-graded up and down ramps, the wide aisles and the concrete guides all aid in minimizing the time and trouble that is required to get in or out of the building.

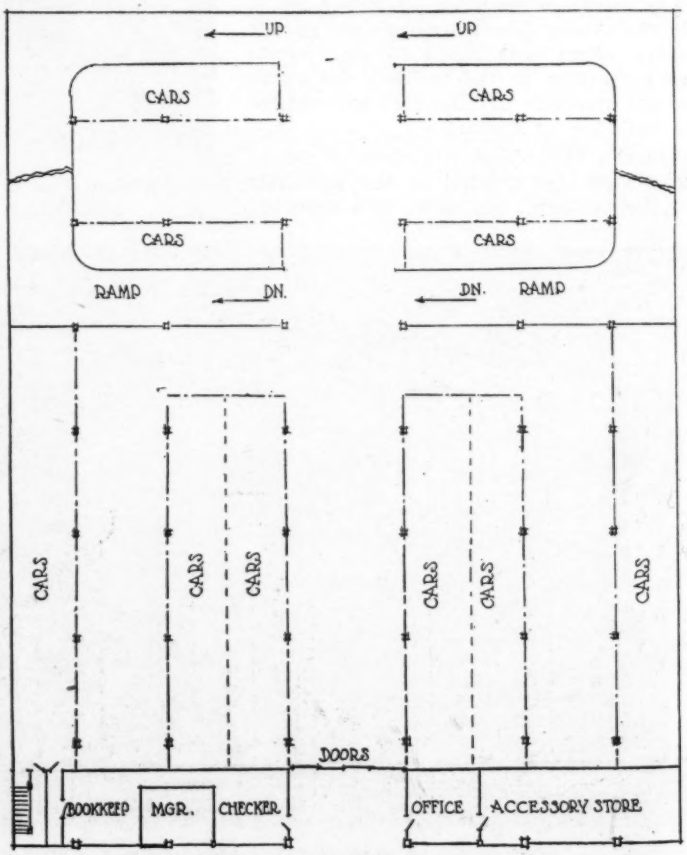
It is easily possible to maintain a speed of 15 miles per hour from entrance to car berth or back again. Consequently a driver can travel the 700 odd feet from the entrance to the farthest corner of the top floor in not much more than half a minute and the average time for the building as a whole is closer to 15 seconds.

Interesting Ramp Design

The design of the ramps is quite new and of great interest because they are unique. In principle the ramps resemble an ordinary screw with a double thread, one thread for up traffic and the other thread for down. Double and triple threads, by the way, will be found on worm pinions for steering gears or axles. Looking from the front to the rear of the building, as shown by the floor plan, a car passes down the broad central aisle and ascends the right ramp to the second floor. The ramp to the left of the main aisle is for descending from the second to the first floor. It will be noted that the ramp is actually not circular but U-shaped. The bottom of the U touches the side-wall of the building, the near leg is in contact with the first floor and the far leg in contact with the second floor. All the ramps are located thus and are placed one over the other.

The progress of a car up or down through the building is roughly a circular one and therefore it is correct enough to speak of them as circular ramps, particularly when their principle is that of the screw with a double thread.

Right, showing location of car rows and ramps. Note the broad central aisle and the ease which which a car space or either ramp can be reached from it



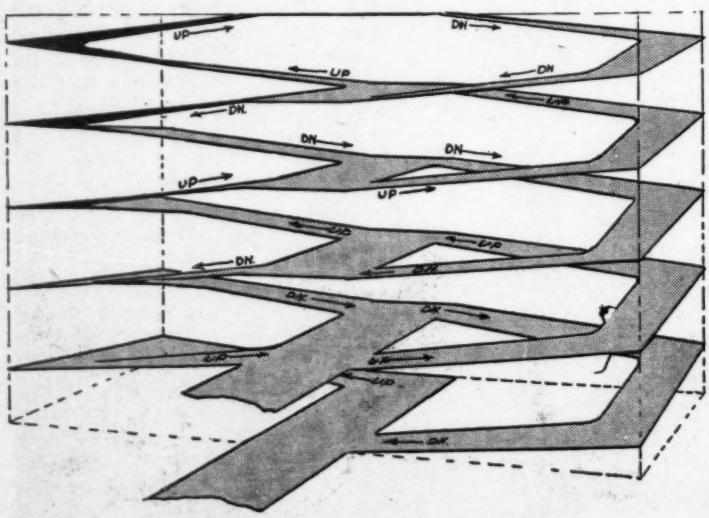


Diagram showing ramp principle. The illustration shows a worm with two threads. One is used for up cars and the other for down cars

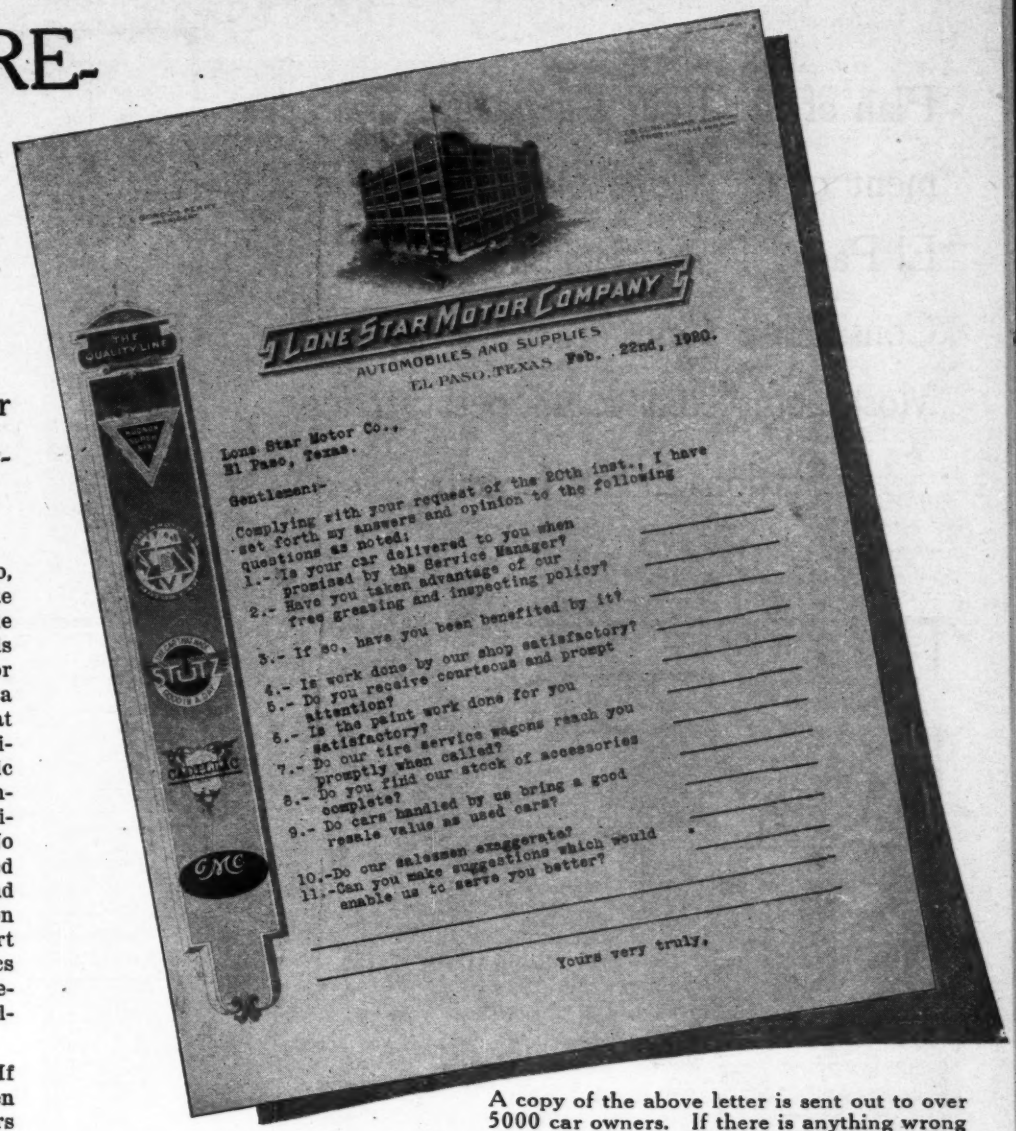
SELLING PREVENTIVE SERVICE

Part II

Making Sure the Owner Is Not Nursing a Grievance in Silence

THE Lone Star Motor Co., El Paso, Texas, service policy is to eliminate the need of service insofar as possible and insists that its customer bring his car in for inspection and lubrication for the first time after he has driven it a maximum of 500 miles. The car is met at the door by F. H. Klohs, and is immediately turned over to an expert mechanic for inspection and lubrication. The general lubrication order form used indicates what the mechanic must do. No charge is made for anything connected with this job except for the oils and greases used. As the work of lubrication subjects every part of the car to expert inspection it is easy for the mechanics to make such recommendations for repair work as the lubrication order allows for.

The matter is then up to the owner. If he is wise he permits the car to be taken to the shop and he allows the repairs to be made.



LONE STAR MOTOR COMPANY

AUTOMOBILES AND SUPPLIES

EL PASO, TEXAS Feb. 22nd, 1920.

Lone Star Motor Co.,
El Paso, Texas.

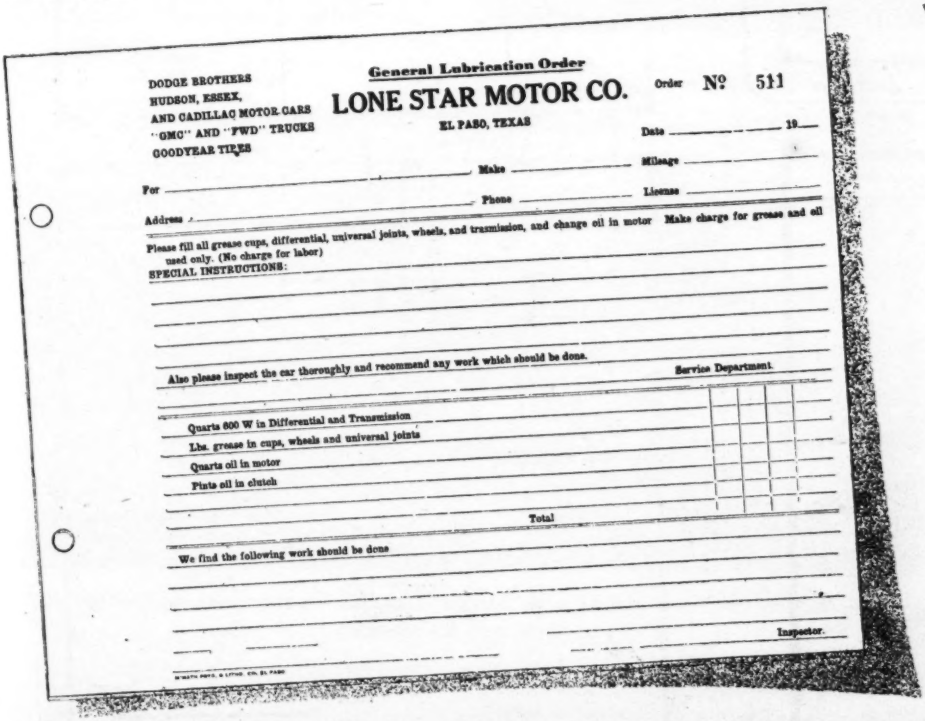
Gentlemen:-

Complying with your request of the 20th inst., I have set forth my answers and opinion to the following questions as noted:

1.- Is your car delivered to you when promised by the Service Manager?
2.- Have you taken advantage of our free greasing and inspecting policy?
3.- If so, have you been benefited by it?
4.- Is work done by our shop satisfactory?
5.- Do you receive courteous and prompt attention?
6.- Is the paint work done for you satisfactory?
7.- Do our tire service wagons reach you promptly when called?
8.- Do you find our stock of accessories complete?
9.- Do cars handled by us bring a good resale value as used cars?
10.-Do our salesmen exaggerate?
11.-Can you make suggestions which would enable us to serve you better?

Yours very truly,

A copy of the above letter is sent out to over 5000 car owners. If there is anything wrong with their service the Lone Star Motor Co. wants to know about it and correct it at once



DODGE BROTHERS
HUDSON, ESSEX,
AND CADILLAC MOTOR CARS
"GMC" AND "FWD" TRUCKS
GOODYEAR TIRES

General Lubrication Order

LONE STAR MOTOR CO.

EL PASO, TEXAS

Order No. 511

Date _____ 19__

For _____ Make _____ Mileage _____

Address _____ Phone _____ License _____

Please fill all grease cups, differential, universal joints, wheels, and transmission, and change oil in motor. Make charge for grease and oil used only. (No charge for labor)

SPECIAL INSTRUCTIONS:

Also please inspect the car thoroughly and recommend any work which should be done.

Service Department

Quarts 600 W in Differential and Transmission
Lbs. grease in cups, wheels and universal joints
Quarts oil in motor
Pints oil in clutch

Total

We find the following work should be done

Inspector

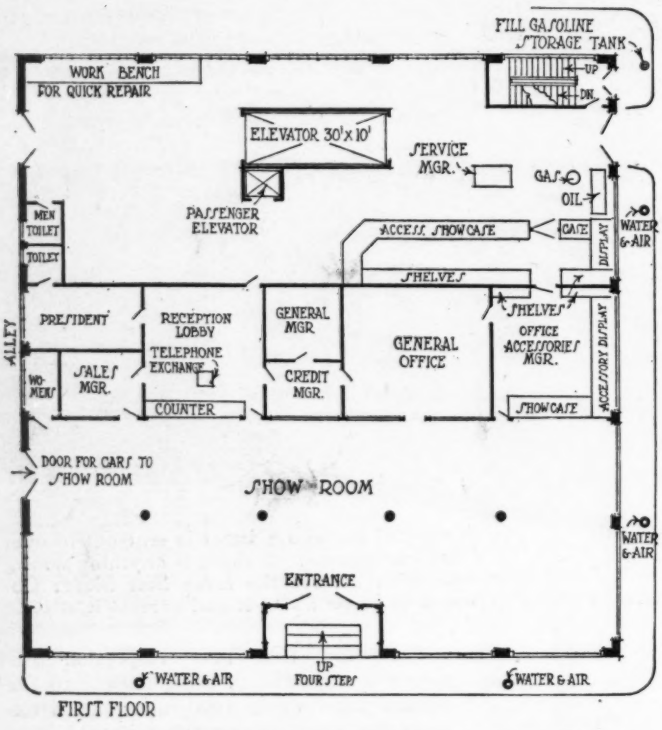
General lubrication order—The Lone Star Motor Co. insists that the customer brings his car in after the first 500 miles and it is gone over thoroughly. If repair work is seen to be needed it is recommended to the owner

Following this first inspection the owner is expected to bring his car to the station after every 1000 miles, when exactly the same procedure is repeated. This sort of service is given free just as long as the car exists, and never is any charge other than that indicated on the order made for either lubrication or inspection. The same plan also is followed with all used cars the company sells, since these are put out with the same guarantee identically that the company puts on new cars.

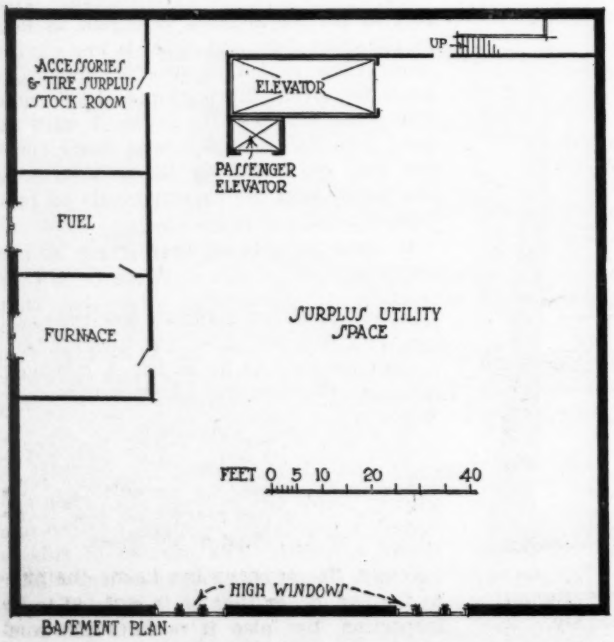
It must be evident that if the owner avails himself of this privilege he always is ahead of any trouble other than that resulting from unavoidable accident. The idea is to keep every car in such perfect condition that troubles cannot magnify themselves nor accumulate.

In order that the customers of the company may be reminded of their privileges in this respect, the company periodically sends out to more than 5000 car owners a questionnaire similar to the one shown herewith. The purpose of this is two-fold. It not only serves as a reminder to the car owner that he is entitled to an inspection, but also it permits the company to use a follow-up when a car owner

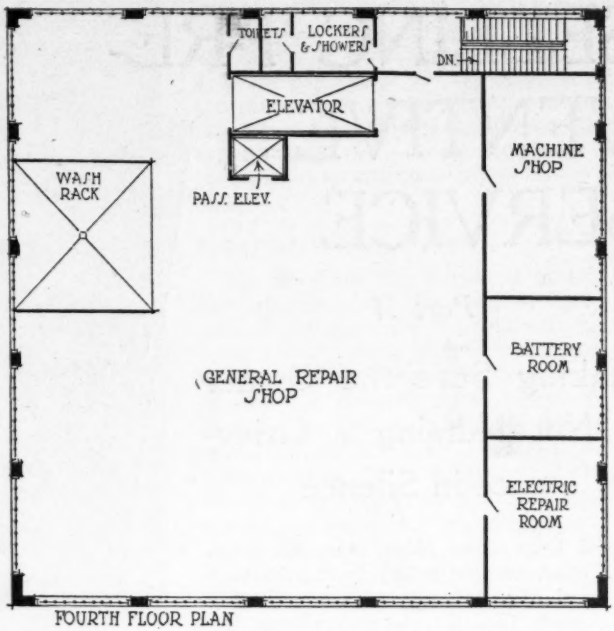
Plan of the Four Floors and Basement of the Lone Star Motor Co. El Paso, Texas, Building which is Considered One of the Best and Most Completely Equipped Service Stations in the Country



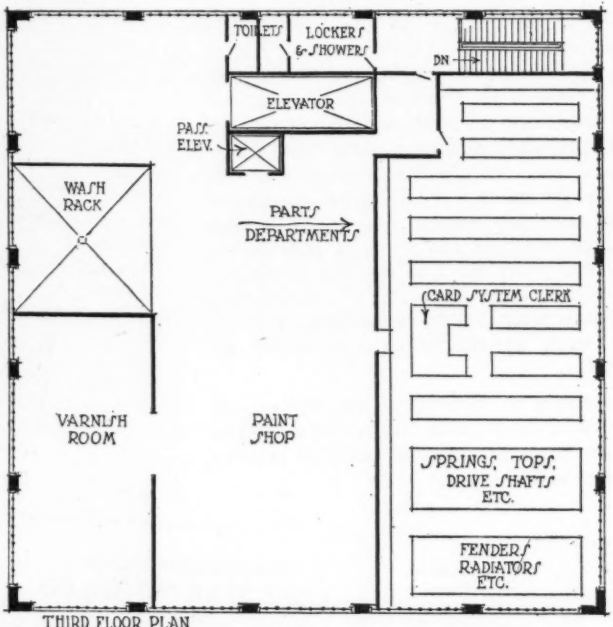
FIRST FLOOR



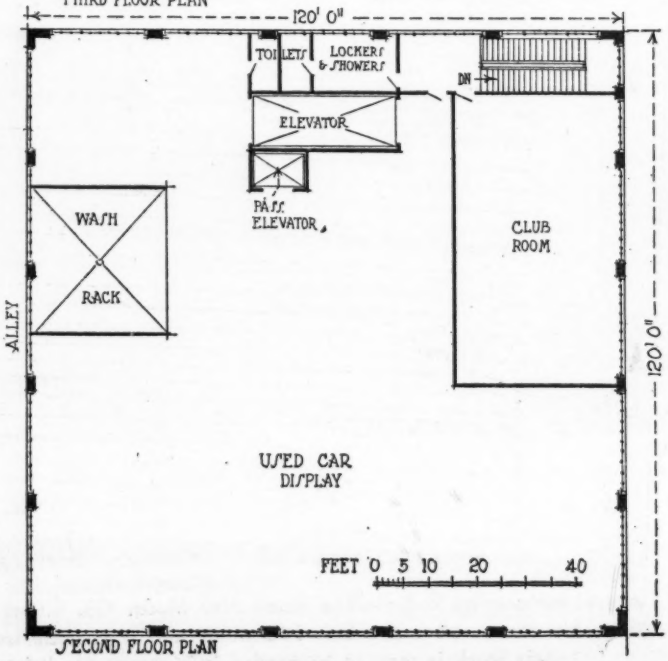
BASEMENT PLAN



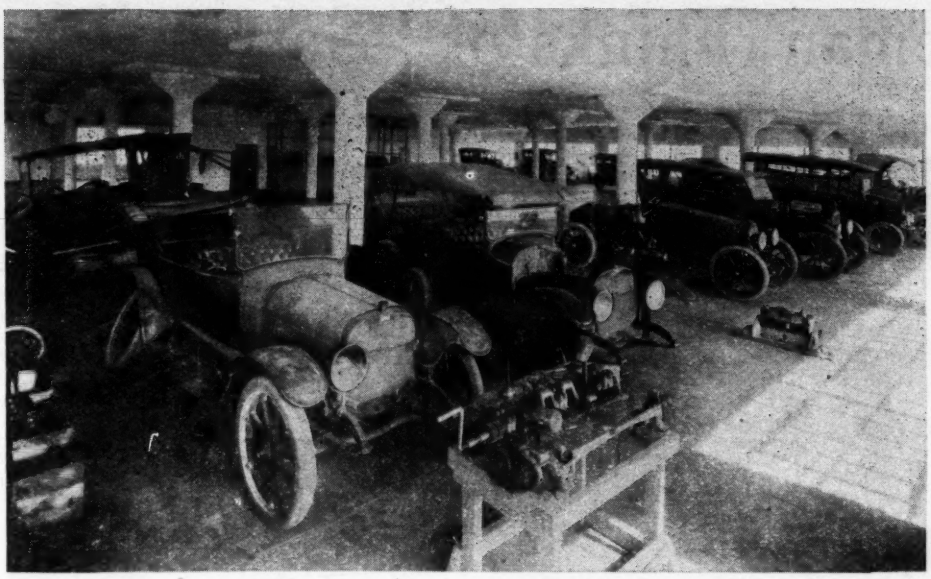
FOURTH FLOOR PLAN



THIRD FLOOR PLAN



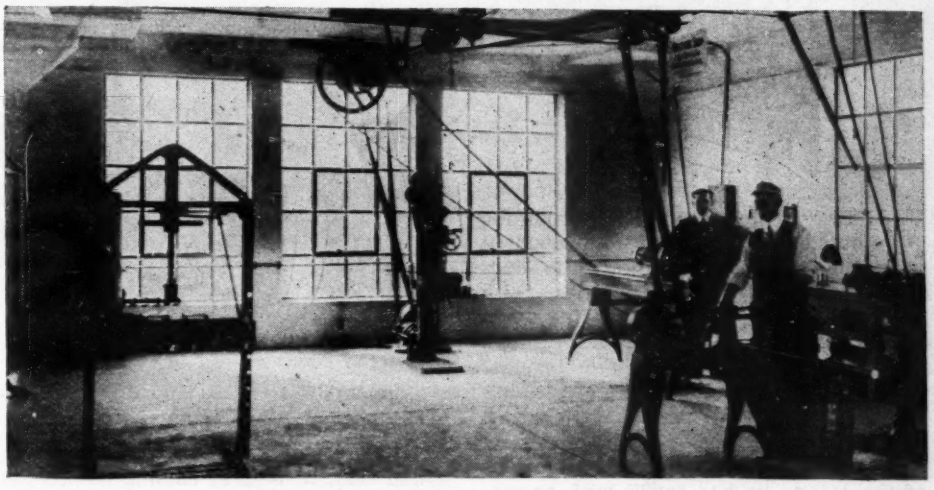
SECOND FLOOR PLAN



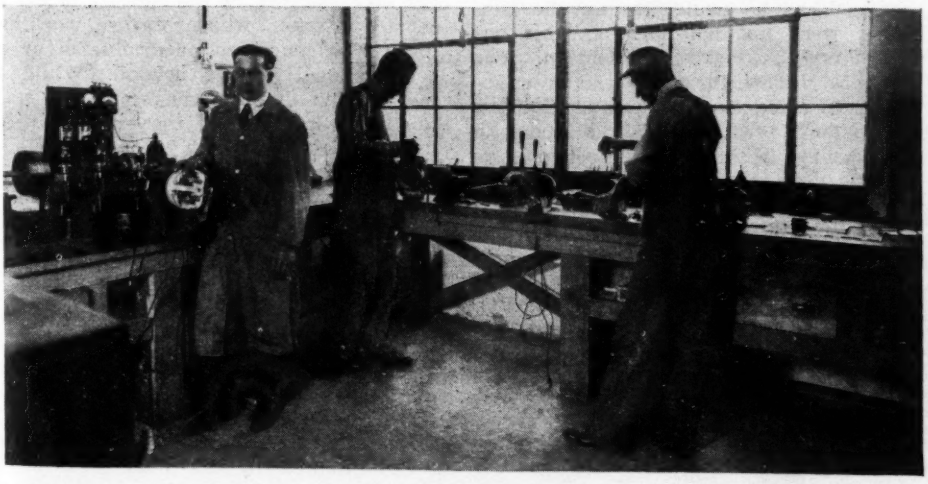
The entire fourth floor is given over to repair work. The company sells so many cars its shop always has plenty to do

has not availed himself of the privilege. As a matter of fact, the periodical inspection of a car is not left entirely to the volition of the owner, because if he has not availed himself of his privilege, he usually says so on his reply to the questionnaire and then the company goes after him and asks, "Why." The Lone Star company thus assumes the responsibility of actually forcing itself on the owner's attention to the end of compelling that customer to give his car the attention it ought to have.

The charges for service and repairs are based upon labor cost and cost of materials used. The company, because of the number and variety of cars sold, never has been able to institute a flat-rate plan. The present plan, especially as it is based upon the lubrication and inspection policy, seems to meet every requirement admirably.



The shop is on the top floor—Note the big windows and the abundance of light



The battery service station which is equipped with all the latest testing apparatus needed in the work

It will have been noticed that the plan of the second floor shows a club room. This is for the pleasure and accommodation of the $3,000,000 Club.

This club is an organization which includes everybody in the Lone Star establishment from President Perry down to the office boy and the janitor. While the club rooms are open at all times, regular meetings are held weekly which everybody and his wife is privileged to attend. It is one of the most democratic of organizations and in it everybody meets everybody else on a basis of equality.

At the regular meetings of the club there always are at least three talks from some member of the organization. These talsk are limited to five minutes and are devoted to ways and means of selling the company. This means the selling of cars, service, accessories, repair shop, courtesy or some such thing. The intention is that at least three departments shall be represented at every meeting and a prize of $5 is offered to the person making the best talk of the series.

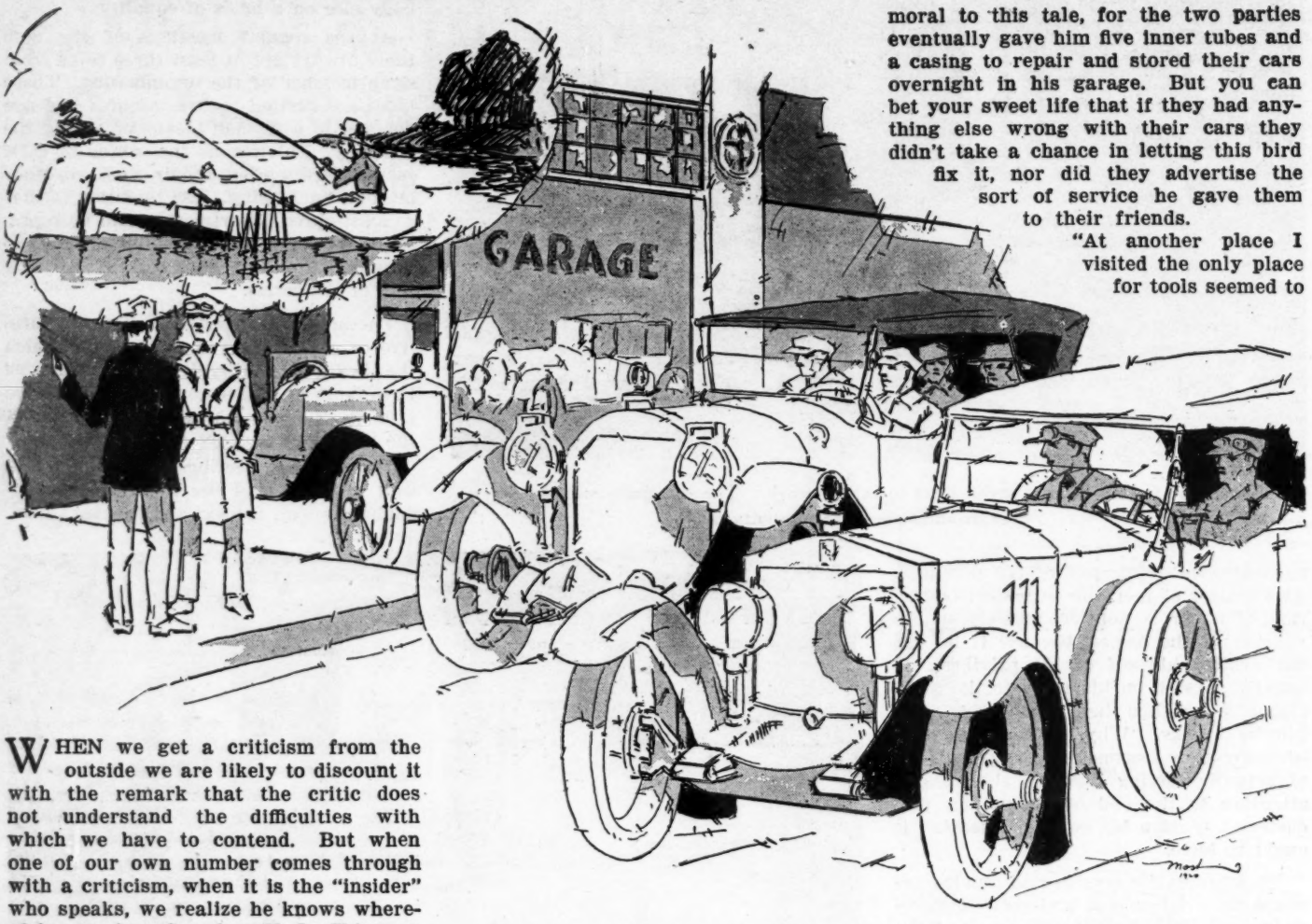
Furthermore, whenever a representative of any of the companies from which the Lone Star buys its goods visits El Paso he is invited to come to the club and talk to the assembled employees about the particular product he represents.

The regular meetings of the club are well attended and the institution is undoubtedly well appreciated by every man, woman and child in any way connected with the concern. The company also gives consideration to outside amusements. Adjacent to the building is a large vacant space on which are being constructed at the present time several tennis courts which are for the use of the employees of the company and their families. In addition it is pertinent also to call attention to the elaborate equipments of toilets, lavatory and sanitary arrangements to be found on every floor of the building.

In short, ideal conditions are provided for the employees. The hope and purpose of the company is to gather a complete complement of experts which will be contented and permanent. This also is a part of the idea of service which permeates every activity of th company, because it wants its building, its organization, its supply of parts and everything else to be complete and efficient at all times.

Lastly, the company has begun the publishing of a periodical which will be known as the Lone Star Spotlight and which will be mailed to several thousand readers.

What a Garageman Thinks of "Service"—



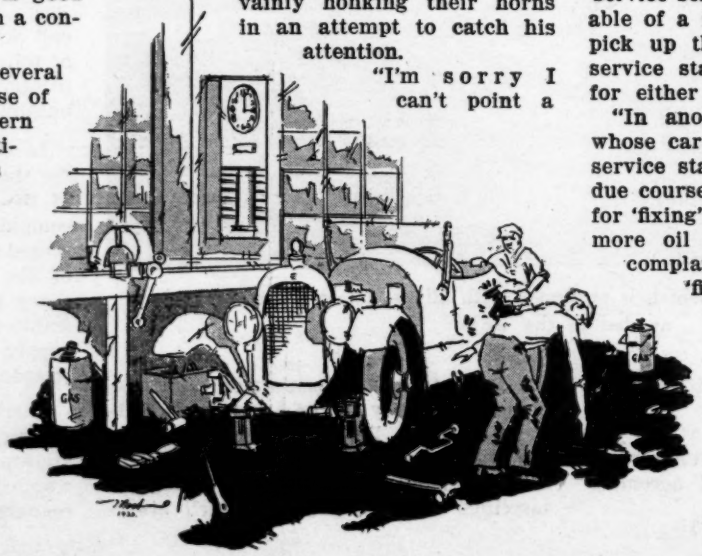
WHEN we get a criticism from the outside we are likely to discount it with the remark that the critic does not understand the difficulties with which we have to contend. But when one of our own number comes through with a criticism, when it is the "insider" who speaks, we realize he knows whereof he speaks. So when K. L. Shirey, a garage and service station owner of Roseburg, Ore., told MOTOR AGE of some of the things he has found with service stations, it behooved us to sit up and take notice.

Mr. Shirey conducts a garage and service station in Roseburg, Ore., a town of 5000 population. He does not mention anything about the kind of service he furnishes there, but when we learn that he regularly employs a force of seven men in a town of this size, we can take it for granted that it is good enough to bring in the trade from a considerable distance around.

He emigrated from Ohio several years ago and it was in the course of his travels through the western states that he formed his criticisms on "service as she is offered" by the majority of stations, in small towns and in big cities.

"I have seen a great many service stations in my travels," says he, "but I yet have to find one which I consider is living up to its opportunity. Some are good in some particulars, but are woefully lacking in others. 'Service' should mean service, not merely a place where a man has to come to have repairs made when he has no place else to go.

"To begin with, there is the question of courtesy. Too often I have found that, instead of coming out to the front of the shop to meet prospective customers, the service man stayed as far back as he could, letting the customer wear out his horn and his patience trying to attract attention. For instance, I saw in one big city, a so-called 'Service Manager' stand chatting nonchalantly with a friend about a forthcoming fishing trip while two large touring cars stood in front of his shop vainly honking their horns in an attempt to catch his attention.



"I'm sorry I can't point a moral to this tale, for the two parties eventually gave him five inner tubes and a casing to repair and stored their cars overnight in his garage. But you can bet your sweet life that if they had anything else wrong with their cars they didn't take a chance in letting this bird fix it, nor did they advertise the sort of service he gave them to their friends.

"At another place I visited the only place for tools seemed to be on the dirty, greasy floor, and when a mechanic went to look for a particular tool he had to hunt all over the shop—at $1.00 per hour per hunt.

"In another place, located in one of the largest cities of the west, I found a service station whose entire working force was made up of graduates of a certain local service school. While I was talking to the manager of this station, I noticed one of these 'mechanics' use gasoline to wash grease from a highly finished body. Is it possible any 'service school' would turn out men capable of a thing like that? Or did they pick up this pretty little trick in the service station? It doesn't speak well for either organization.

"In another case, a friend of mine whose car pumped oil, turned it into a service station. He received it back in due course, together with a bill for $125 for 'fixing' it, only to find that it pumped more oil than before. And when he complained to the man who had 'fixed' it, he was met by the reply that 'we can't do anything with it.'

"There is too much of an effort on the part of some service shops to turn out jobs without a knowledge of the machines they are working on. They figure that they can substitute two cheap men for one good one.

"That is all wrong. I found out years ago that it cost me a whole lot more to hire two $3 a day men than to hire one $8 a day man. The $8 man was doing $8 worth of work for men and the two $3 weren't doing much of anything except giving me a lot of dissatisfied customers.

"After all, the cure for most of our service evils lies in the production of good mechanics. Good mechanics are good salesmen, for their work speaks for itself. But don't let your customer wear out his horn before you show him that your service is worth buying."

SERVICE MANAGERS WHO HAVE MADE GOOD

No. 2 of a Series of Articles Telling Why Some Men Are Holding Their Present Jobs

There always is one or more good reasons why a man makes good on a job, and there always is a good story back of the success of a service manager in the automotive industry. Motor Age believes many of its readers who are service managers would like to know why other men in their line made good.

Motor Age is publishing herewith the second of a series of articles telling the inside story of these men. If you as a dealer think your service manager is making good for you, we suggest that that you send us his picture and tell the story about him. One man's ideas will help the other and collectively they will help towards the betterment of service.

JOHN C. STREBEL, manager of service for the O'Brien Motor Co., Indianapolis, distributors of Pierce-Arrow cars and trucks, believes that the highest type of mechanical brains and ambition should enter into the personnel of the men in the shop.

Owners of high-grade motor cars and trucks should have that service—service which is to give them the best of enjoyment for their motor car or the greatest of dividends from their car. In the case of both, the vehicles must be kept running, and in the process of keeping them running, much has to be done to the car—in careful inspection, to see that needed work is done before the situation becomes critical.

"Any old mechanic won't do," said Mr. Strebel. "Education which is worth while is that well done. 'A little knowledge is a dangerous thing' in motor car service work. We try to get factory trained men, of course, but lately we have had the finest results from getting highly trained mechanics, such as toolmakers, who are mechanics by instinct and years, and train them to motor car and motor truck work. They are not so young as other mechanics, but their work is much more satisfactory. The race is not always to the swift and good work is done by the matured as well as the youth."

John C. Strebel, service manager of the O'Brien Motor Co., Indianapolis

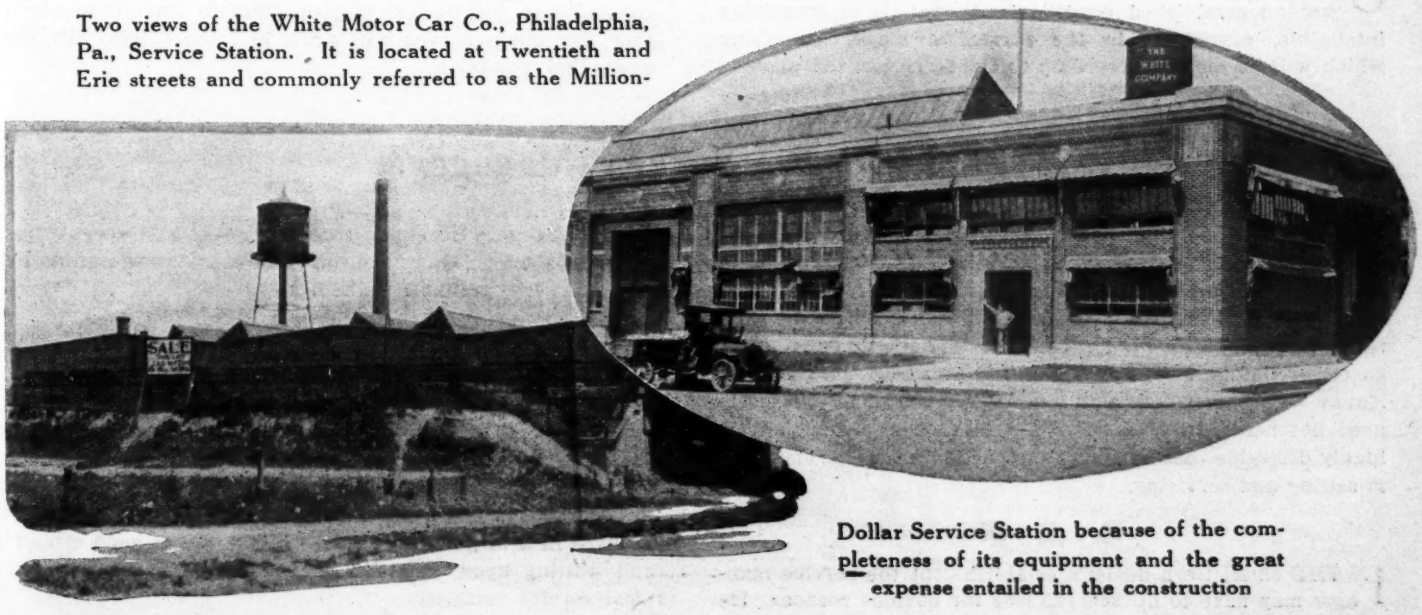
Strebel believes in the Pierce-Arrow product, believes in automotive transportation. For 15 years he has been working on or with Pierce-Arrow products. He started in at the bottom and learned Pierce-Arrow products thoroughly at the factory. Later, after he had received his schooling, he was road service manager and following that service was factory representative in Indiana for two years.

With that cumulative experience, he became service manager for the Foss-Hughes Co., Washington, D. C.; Fred P. Brand Motor Co., Cleveland, and the Arrow Motor Co., Springfield, Mass., all Pierce-Arrow agents.

Mr. Strebel after that experience, became connected with the Fred R. O'Brien Motor Co. at Indianapolis and is seeing that all Pierce-Arrow products in the Indiana territory are getting the best of service.

The Million-Dollar Service Station

Two views of the White Motor Car Co., Philadelphia, Pa., Service Station. It is located at Twentieth and Erie streets and commonly referred to as the Million-Dollar Service Station because of the completeness of its equipment and the great expense entailed in the construction



EDITORIAL

To Succeed in Business You Must Be a Manager

IN order to have a smoothly running selling and servicing business on motors cars, trucks or tractors, the man at the head of the business must above all things be a manager. The service manager, the shop manager, the office manager or any of the other executives might be specialists in their particular line, but it takes another person, the general manager, in this case generally the dealer, to coordinate the efforts of the personnel.

WHETHER the dealer wants to keep his shop or simply run a service station and do away with selling of vehicles is a question to be answered by the dealer himself. It will hinge on several things. The dealer who is a real salesman, who thinks selling, dreams selling and cannot get his mind on any other phase of his business might be justified in divorcing the shop. On the other hand, the dealer who is all wrapped up in the servicing of cars might leave the selling of them to someone else. He might not be good enough a salesman to run a sales and service station too.

THEN we have the managers. Take a salesman who makes a good leader. Add the qualities of the service man who knows the how and why of automotive service and then add the ability to manage a business—and you have the dealer who will suceed no matter into how many departments his business might be divided.

Wages and Production

ONE important fact that has a pertinent bearing on the subject of production in these days of the H. C. L., is that output is diminishing as wages increase. With only a few more engaged in industry, together with a proportionately greater increase of population, we must eventually come to the point where the declining curve of production falls so far short of the rising curve of demand that some third force will be necessary in order to re-establish a basis of comparative equilibrium. What this third force may be we cannot say.

ONE thing is certain, very luckily, that this third force is not an established condition. As yet, it is something intangible, something in the formative stage, something which will be molded according to the force exerted upon it.

IN OUR manufacturing centers it is a common sight to witness men working but four or five days a week. When questioned about it, their reply is that they are now paid as much for four days' work as they used to get for six. Consequently they only work about four days a week.

HOW about the output? Can a man produce in four days what he could in six days, using the same efficiency machinery and working at the same rate?

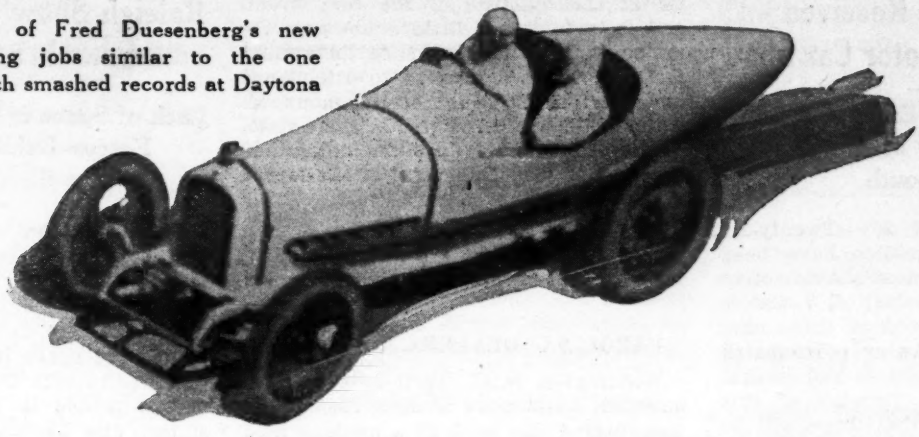
THERE seems to be only one logical answer to the whole thing. We all must work more, and produce more! The consumption will be less in proportion to that produced. In this way our reserves will grow and the prices will start a gradual recession.

Who Is the Service Manager?

WHAT qualifications must the ideal service manager possess and just what member of our organization is he? He is not or should not be the foreman of the shop or the superintendent. He is the point of contact between customer and the dealer's business. He is the one that greets the customer the minute he comes in and sees that the customer leaves with the feeling that everything was done well. He need not necessarily be an expert mechanic, although it is highly desirable that he knows the particular car his employer is selling and servicing.

IN THE small town dealer's establishment the service manager may have to fill several jobs for obvious reasons. He may be the shop foreman, trouble shooter and service manager, but even so, there are things he must know and do that will make him valuable to the dealer.

OBVIOUSLY the service methods of the dealer in a large city will differ from those used by the small town dealer. And while the methods might differ, brought about largely by the difference in the volume of work, the product to be sold, i. e., service, is the same. Every car owner, whether he lives in a large or small town, likes to get good attention and waiting upon, and that is one of the first jobs of the ideal service manager.



One of Fred Duesenberg's new racing jobs similar to the one which smashed records at Daytona

Milton Smashes More World Marks

Star Duesenberg Driver Sets Record for From One-Half to Five Miles and Will Go After All Distances Up to Twenty Miles

DAYTON, Fla., April 25—Tommy Milton became the unchallenged Speed King of Motordom to-day when he hurdled his great sixteen-cylinder Duesenberg racer to new world's records for all distances from one-half up to five miles. Milton smashed to bits all the former marks held by Ralph De Palma and the airplane-engined Packard which were made a year ago over the same course and which were then regarded as the greatest speed possible in a machine running over land.

Milton's attempts at the records had been twice postponed, first from more than a month ago, in order to permit him to compete with the Duesenberg team in the Los Angeles Speedway events, in one of which he was victorious and again from last week on account of adverse weather conditions. The postponements, however, did not serve to lessen interest in the trials and the motoring world has long been on the qui vive for news of Milton's work.

Carries Two Engines

While no official details have been given out in regard to the car in which Milton set his record, it is probable that it is the same car which he was to have used in the trials when first proposed. At that time, Fred Duesenberg, designer and constructor of the cars, informed MOTOR AGE that the racer was a sixteen-cylinder affair carrying two of the eight-cylinder engines which won several races for the Duesenberg team last year. These engines were placed side by side, each driving one rear wheel, thus eliminating the differential. The combined cubic inch piston displacement of the two engines is 593.8, slightly less than the Packard with which De Palma held the former marks.

Milton set his first record Saturday when he went the mile in 23.6 and the two miles in 47.16. This gave him a slightly lower time for his second than for his first mile, but the slower time had to stand as official, for under A. A. A. rules only the first mile of a trial can be counted as official. His respective miles per hour for the two distances were 152.5 and 152.9 for the two distances.

Throughout the first day's trials, Milton complained of having a little trouble with his engine, but when he wheeled to the starting line to-day, he declared this had been eliminated. His first effort to-day was for the half-mile mark, which he turned in 11.86, a rate of 151.77 m.p.h. He then clipped off the kilometer in 14:65, an average of 152.9 m.p.h. and set a new mark for his unsatisfactory mile in 23.56, a record of 153.1 m.p.h. His two-mile was accomplished in 47.16, his three-mile in 1:12.18, his four-mile in 1:36.14, and his five mile in 2:00.04.

At the conclusion of his five miles, Milton announced that he was through with his trials for the day, but that he expected to resume some time this week and go after all marks up to twenty miles. The marks between five and twenty miles are still held by De Palma.

NEW WORLD'S SPEED RECORDS

Old Record					New Record			
Holder		Time	M.P.H.	Distance	Holder		Time	M.P.H.
De Palma				½ mile	Milton, Duesenberg		11.86	151.77
De Palma,	Packard	24.02	149.72	1 mile	"	"	23.56	153.10
"	"	49.54	145.27	2 miles	"	"	47.16	152.09
"	"	1:15.04	145.02	3 miles	"	"	1:12.18	149.07
"	"	1:39.77	144.05	4 miles	"	"	1:36.14	149.08
"	"	2:04.58	144.03	5 miles	"	"	2:00.04	149.04
"	"	14.98	150.00	1 kilometer	"	"	14.65	157.09

Fred Duesenberg, designer of the new world's-record making car

Tommy Milton, driver of the Duesenberg 593.8 cu. in. record maker

Many Entries Are Received for Macon Motor Car Show

Georgia Exhibit is Expected to Be Leading Display of the Year in the South

MACON, Ga., April 26—Twenty-six makes of automobiles have been entered already for Macon's Automotive show to be held here May 6, 7 and 8. Space has been assigned to these cars as a result of the drawing participated in by all of the local dealers and several from other cities on Tuesday of this week. It is expected that there will be several additional eleventh hour entries, as is customary in automobile shows.

In addition to the twenty-six automobiles represented there are a large number of trucks and accessory firms to be represented in the show and more are to enter just as soon as they make sure that factory shipments will reach here.

Cars to be represented include: Oldsmobiles, Marmon, Hudson, Essex, Ford, Hupmobile, Stearns, Knight, Chevrolet, Overland, Buick, Cadillac, Franklin, Allen, Case, Paige, Dodge, Standard Eight, Chalmers, Maxwell, Davis, Columbia, Pan-American, Oakland, Westcott, Liberty.

To make sure of a good crowd attending the show, the only one to be held in the Southeast at this season of the year, fifty cents admission will be charged, which follows the custom of the bigger shows.

A Farm Motor Truck Demonstration Tour will start from this city on Monday, to continue for one week, as a curtain raiser for the Macon Automotive Show. The show is being held under the auspices of the Macon Automobile Dealers' association, the Macon Chamber of Commerce, the Woman's Auxiliary of the Chamber of Commerce and the Bibb County Farm Bureau.

SPOKANE TO HOLD TRUCK PARADE

Spokane, Wash., April 25—Spokane will celebrate ship-by-truck and good roads week, May 17 to May 22, with a parade demonstration that promises to include 1500 trucks, almost ten miles of cars, according to Harry A. Hooper. Governor Hart of Washington will be asked to issue a proclamation urging state-wide co-operation, and Mayor Fleming, who has already indorsed the move, will be asked to declare May 22 a municipal holiday. Moving pictures of the parade will be taken for distribution throughout the nation.

WILMINGTON SHOW IS CLOSED

Wilmington, N. C., April 25—Wilmington's first annual automobile show closed in a burst of glory. As the last notes of the last selection by the Royal Scotch Highlanders' Band died away every automobile horn in the vast auditorium blared in unison, and the event passed into history with a fanfare of toots not soon to be forgotten.

Officials of the show are very optimistic of the outcome of the first event, and it is said that little doubt now remains that it will be made an annual feature. Final figures as to attendance and receipts have not been announced. Automobile concerns from this state, Virginia and South Carolina maintained exhibits, as well as several of the larger manufacturers.

There is a growing demand for automobiles in this section, and particularly for trucks for the movement of crops.

CAROLINA DEALERS ORGANIZE

Wilmington, N. C., April 24—The Wilmington Automotive Trades association was formed this week at a meeting held at the offices of the W. D. McMillan, Jr., garages. Mr. McMillan was elected president; Alex North, vice president, and R. F. Johnson, secretary and treasurer. The directors include the officers and J. D. Piner, J. B. Rice and C. H. Jones. The association will be affiliated with the national association. The purposes of the association will be to promote all matters for the benefit of the trade in the city of Wilmington and the eastern section of North Carolina.

VANCOUVER DEALERS ORGANIZE

Vancouver, B. C., April 26—A new association officially named The Vancouver Motor Dealers' association was formed recently for the purpose of promoting better business among dealers and better service for motorists.

Already the association has taken a large part in the changing of the road rule in the Province of British Columbia, while plans are now under way for a big automobile show in conjunction with the annual exhibition.

The officers of the association have been elected as follows: president, E. J. Holston; first vice-president, J. R. Sigmore; second vice-president, M. Boswell; treasurer, W. G. Patrick; secretary, A. H. Kerr.

NEBRASKA CITY HAS SHOW

Nebraska City, Neb., April 24—Nebraska City's first annual automobile show came to a close here to-day. The show extended over three days and included cars, trucks and tractors.

NO BLOOMINGTON DEMONSTRATION

Bloomington, Ill., April 25—Two successive blizzards, and an almost daily visitation of rain, during April, compelled the Bloomington Automobile and Tractor association to call off the proposed power farming demonstration and exhibition of tractor plowing. The first date selected was April 10. A postponement was then taken until April 17, when it was found that the second date was impossible, a decision was reached to give up and plan a similar event after harvest next fall. It was believed that even if a favorable date could be selected towards the latter part of April or opening weeks of May, all farmers would be so behindhand in their spring work that they would have no time to attend a public demonstration.

Raleigh Show Is Housed in a Tent This Season

Lack of Space in Permanent Building Forces Exhibitors to Take Up Circus Methods

WILMINGTON, N. C., April 25—Raleigh's annual automobile show, the premier event of this kind in the state of North Carolina, was conducted in a huge tent this year, on account of inadequate space in the city auditorium in order to take care of the large number of people in this and neighboring states, who demanded exhibition space.

It is declared that this show was the biggest thing of its kind ever staged in the United States. Under the vast canvas were crowded 136 machines. It is said that New York never had more than 103 at one time. Ten thousand people attended the show on the last night, hundreds being attracted by the big dance with which the exposition wound up.

Raleigh believes that as a result of this show it has captured many machine agencies and that the state capital as a result will become the center of distribution for automobiles in this state. That was the primary purpose of the exposition.

ATLANTA PLANS FOR TRUCK TOUR

Atlanta, Ga., April 25—Announcement has been made by the Georgia Automobile Dealers association and the Firestone Ship By Truck Bureau that plans are being formulated for a "Ship By Truck Week" to be held in Georgia during the week of May 17-22.

At this time truck trains will operate on all of the principal automobile road routes in the state, making a free delivery of goods and explaining the advantages of truck transportation.

All truck owners have been asked to enter their trucks for the tours and the routes probably will be announced before May 1.

KENOSHA DEALERS ORGANIZE

Kenosha, Wis., April 26—Dealers and service men of Kenosha, Wis., who have been associated in an informal way for several years, have organized a new society under the name of Kenosha Garage and Dealers' association, for the general advancement of the automotive business, good roads movement, and mutual betterment. Andrew H. Dahl, Ford dealer, and formerly state treasurer of Wisconsin, was elected president. George Greiner, Nash dealer, is vice-president, and Thomas Scott, owner of the Sheridan Road Garage, secretary-treasurer. Every one of the 22 dealers and garage proprietors in Kenosha have signed the charter roll. Meetings will be held monthly, the next being scheduled for Wednesday, May 12, at the Elks Club. Future Kenosha shows will be directed and managed by the association.

Hamilton Stages Highly Successful Exhibition

Display is Said to Be Largest of Any in Canada Outside of National Events

HAMILTON, Ont., April 24—The big motor show that closes here tonight is the largest and most successful automotive exhibition ever held in the province of Ontario with the exception of the annual national Motor Shows at Toronto. In attendance, sales and prospects as in diversity of exhibits the show has been a real success and is so pronounced by the visitors, the trade and management. It is the first motor show held here since the 1914 ante-bellum days. Hereafter it will be held annually.

The exhibition staged by the Hamilton Automobile Dealers and Allied Industries, under the management of G. O. Philip and G. D. Pequegnat. It continued all week, and a 35-cents admission fee was charged. Despite the wonderful capacity of the armories all space had been sold within two days of the plan being sent out, and applications for allotments of space from all over Canada had to be regretfully turned down. The preference was given to Hamilton dealers, all of whom secured space. A number of Toronto dealers of cars not represented in Hamilton had attractive exhibits as had also not a few manufacturers.

KENTUCKY DEALERS TO ORGANIZE

St. Louis, Mo., April 26—A call has been sent by Harry G. Moock, general manager of the National Automobile Dealers' Association to the industry in Kentucky asking for an opinion as to whether Kentucky wants a state association.

ELECT LITTLE ROCK OFFICERS

Little Rock, Ark., April 24—Chas. E. Shoemaker of the Shoemaker-Bale Auto Co. has been elected president of the Little Rock Automobile Dealers association for the ensuing year. Jim W. Green of the Green Motor Co. was elected vice president in a very close contest. C. P. Hopgood of the Arcade Motor Co. was elected treasurer and E. M. Rowe of the Rowe-Woolfolk Auto Co., Frank L. Reed of the Paige Co. of Arkansas and the Reed Motor Co.; J. N. Moxley of the Moxley-Graham Auto Co.; and F. L. Oilar of the Oilar-Overland Co. were elected members of the Board of Directors. The retiring treasurer, S. R. Thomas of the Thomas Auto Co. reported that a dividend of approximately 35 per cent would be paid to the exhibitors at the recent show.

IOWA DEALERS IN CONVENTION

Des Moines, Iowa, April 25—Iowa motor dealers took part in the three day Iowa Business Congress which was in session in Des Moines last week. Each day during the convention the motor car dealers held a round table meeting at luncheon. Ed. Peake, Harry Moock and Andy Knapp, secretary of the Iowa Motor Trades Bureau were the principal speakers at the conferences. C. O. Hart presided each day over the sessions.

N. A. C. C. IN TEMPORARY QUARTERS

New York, April 25—Offices of the National Automobile Chamber of Commerce will be in the Grand Central Palace, New York, until after July 1. The Chamber planned to move from its present quarters, 7 East Forty-second street, on May 1 to the new Marlin-Rockwell building at Madison avenue and Forty-sixth street. Strikes, however, have delayed the completion of the new building until July 1.

OHIO INSPECTS GAS STATIONS

Cincinnati, O., April 24 — Announcement at Columbus that state authorities will inspect gasoline filling stations all through the state because of complaints that short measure is being given since the recent advance in the price of gasoline, will have little effect in Cincinnati, it is predicted. This city, it is said, is relatively free from this practice, due to the activity of the local inspection bureau.

Chicago Dealers Open Third Used Car Show

"Mechanically Inspected Machines" Draw Good Crowds at Coliseum Building

CHICAGO, April 28—Chicago's annual Used Car Show opened this evening at the Coliseum with more than 300 machines on display. It is expected that before the show ends a week from today the total number of individual cars to be exhibited will be in excess of 2,000.

Almost all members of the Chicago Automobile Trade association are represented at the show. The number of exhibitors listed is 71 and the average numbers of cars exhibited by each is about four. These cars will be removed from the building as quickly as they are sold and will be replaced by other machines from the dealers' stocks. In order to avoid inordinate confusion in the removal and replacement of exhibits, removals are limited to three times a day —at the noon hour, at 6 o'clock and at the close of the evening's session.

Every indication was that the dealers would do more business this year than ever before. The abnormal demand for used cars this year reflects the demand for new cars. Hundreds of persons who had contemplated buying new cars this year have been forced into the used car market, either because the prices of new machines are more than they care to pay or because they are unable to obtain delivery on the new machines. As a result the demand for used cars is and has been the briskest in the history of the trade in Chicago.

Prices reflect the general heavy demand. The marks quoted on the machines exhibited at the opening tonight were surprisingly high. In some cases machines were being sold for almost as much after a season's use as they brought originally a year ago. This reflected an extremely low depreciation on motor cars in general and indeed gave the dealers an excellent selling point.

Stockholders of the Elgin Motor Car Co. held a convention last week in Chicago. Representatives of nearly every state in the Union were present

Holds That State Is Liable for Damages on Dangerous Roads

BOSTON, April 23—Motorists and others traversing the highways of Massachusetts, where limbs of trees protrude and hang so low over the road that damages to vehicles frequently happen, need no longer suffer any loss, according to a decision of the full bench of the Supreme Court, handed down yesterday in the case of the Valvoline Oil Company against the town of Winthrop.

The award of damages of $91.19 to the oil company for injuries to the roof of a wagon which came in contact with the limb of a tree which protruded seven feet over the highway on Herman street, Winthrop. The tree in question was 50 years old, though in a sound condition.

The Appellate Division of the Municipal Court found in favor of the town, but the Supreme Court reversed the decision. It is as follows:

"While many cases have been considered by this court involving injuries to travelers on a highway caused by trees standing within the limits of the way, yet we are of the opinion that there is no sound distinction between the liability of a city or town for failure to guard against defects caused by trees within the limits of a highway, which are old and decayed, and those which, although sound, in course of time cause a defective condition of a highway by growth. Anything in the state or condition of a highway which renders it unsafe for ordinary travel is a defect or want of repair."

MAY POSTPONE YOSEMITE RUN

Los Angeles, Cal., April 25—Unusual weather conditions may necessitate the postponement of the annual Los Angeles-Yosemite Valley economy run from the original dates, May 7 and 8. Reports are to the effect that the road to the valley is covered by snow eight to ten feet deep in the Chowchilla mountains. Should the snow disappear entirely by the date of the run it is probable the dirt road would be soft, that the cars could not negotiate the steep grades. A bridge is out near Wawona and this would add to the difficulties. The contest is open to Los Angeles motor car dealers only and despite conditions they may decide to tackle the undertaking as a more spectacular demonstration of automobile reliability, although the basis of the run is ton mileage economy.

HERRING QUITS AIR FIELD

Des Moines, Iowa, April 26—The Herring Motor Co., the pioneer of middle west motor equipment dealers, who entered the airplane field, has sold its airplane department and will retire from that field. The purchaser of the department is the Curtiss Iowa Aircraft Co., which is owned by W. B. Swaney, motor car distributor of Ft. Dodge, and with branches in a number of Iowa towns. Mr. Swaney takes over the lease on Herring field and will build hangars and continue the plans for expansion which had been made by the Herring Company for the coming season. In announcing his retirement from the airplane field, C. L. Herring stated that he had no question of the future of the airplane business, but that on account of the period of development which it must undergo he did not feel that his company could divide its work between the airplane field and the general automotive field.

CAN'T SELL ROAD BONDS

Los Angeles, April 26—Stating that the existing rate of 4¼ to 5½ per cent interest is so low that the sale of state highway bonds is impossible and that the last bond issue of $40,000,000 is inadequate to meet the work projected in the face of a 25 per cent increase in cost of construction, N. D. Darlington, state highway engineer, has suggested to the county supervisors of the state that new methods of raising the money be adopted.

WILL WE SOON HAVE "GAS CARDS?"

Cincinnati, April 25—Use a a card system in the distribution of gasoline as a means of combating the shortage and to bring about a reduction in price is urged by Oliver E. Conner, Jr., Cincinnati geologist and mining engineer, who has recently completed a survey of the crude oil and gasoline situation in the United States.

"Only by strict governmental control of the liquid fuels can a crisis in the oil situation be prevented," Mr. Conner said. "I was in a town the other day where only physicians and owners of trucks were permitted to buy gasoline.

"The daily production in the United States has fallen from 1,122,000 barrels to 1,060,000 and the time to economize is at hand. From 8,000,000 gallons in 1913, the consumption has jumped to 4,600,000,000 gallons in 1919. With 7,000,000 automobiles now in use in this country, one can readily appreciate the necessity for some strict measures to regulate and control the sale of gasoline."

LOW WATER STOPS MOTOR TRAVEL

Buffalo, April 25—Low water in the Niagara River worked havoc with automobile travel between Buffalo and points on the Canadian side of the border during the first two weeks of April. Ice jams extending across the lower end of Lake Erie and adverse winds kept water in the river at the lawest stage in years.

As a result decks of ferry boats plying between the two countries were so low passenger cars and trucks could not negotiate the drop from dock to deck. There were often days when Fords were able to use the ferry boats but all heavier passenger cars and trucks were either held up or forced to make a sixty mile detour to cross the river at Niagara Falls.

Motorists of both countries say the occurrence again shows the need of a vehicle bridge at Buffalo, such as is now planned by four railroads doing international business.

Los Angeles Tractor Men Start Campaign for Sectional Show

LOS ANGELES, April 28—An energetic and timely campaign has been undertaken by the Los Angeles Tractor and Implement Club to secure one of the four regional tractor shows for their city. W. W. Rainey, president of the club, has taken the matter up with all of the members of the show committee and has received assurances which lead him to believe that Los Angeles will be favorably considered when the show committee meets on May 12.

J. B. Bartholomew, president of the Avery Co., is in Los Angeles at this time and is said to be favorably disposed toward recommending this city for one of the shows. He has been in communication with Finley P. Mount, of the Advance Rumely Co., who also is said to be favorably disposed toward a show in southern California.

The plan under contemplation would bring the show here some time in September or October and the probabilities are that it would be held in the open because of the delightful weather conditions prevalent at that time of the year. Ample space is available for making such an outdoor display. There are numerous candidates for the position of manager, but it is understood here the position will belong to Guy Hall of Kansas City provided he accepts the proposition made to him by the N. I. D. A.

CYCLISTS COMPETE AT WORCESTER

Worcester, April 26—Motorcycle riders from New York, New London, Providence, Springfield, Boston, Portland and other places in New England gathered here recently to participate in the annual races of the Massachusetts Motorcycle association. More than 3000 people were present.

Albert Terpening of New York, known as "T N T," for the record he has established, was the individual star of the day, capturing first place in four events, second place in two events and third in

one. Kendall Sanders of Worcester was a close competitor of Terpening, especially in the amateur solo of the engine stocks not exceeding 74 cubic inch displacement, when the former beat Terpening by a fifth of a second. The big event of the day was the expert solo for engines not exceeding 80 cubic inch displacement. This was open to all and was won by Burns of California.

COLUMBUS TO TAX DEALERS

Columbus, Ohio, April 27—An ordinance is pending in the city council of Columbus providing for an occupational tax which will affect automobile and truck dealers, repair shops, garages and tire establishments. The ordinance is modeled after that in effect in Cincinnati which has been tested in the courts and declared constitutional. It will probably be passed by the council. The ordinance provides for a yearly tax of $100 for automobile and truck dealers; $100 for automobile factories; $10 to $75 for public garages; $50 for accessory dealers; $10 to $175 for repair shops and $25 for automobile schools.

TO TEACH OWNERS ON "SERVICE"

Spokane, Wash., April 25—In addition to its functions as a dealers' organization, the Spokane Automobile Chamber of Commerce has inaugurated a campaign as a motor car educational organization, its efforts being put forth to teach the car owner as well as the dealer the nicer points of service, co-operation and the gospel of good will. In keeping with these plans speakers of note will be secured to address the weekly luncheon gatherings, at the Davenport hotel, many of these speakers being men in lines of trade not connected with the motor car industry.

Cleveland Battery Men Move to Combat Rental Abuses

CLEVELAND, April 25—At a recent meeting of the Electrical Division of the Automotive association it was decided that one way to alleviate the rental battery abuse was: Each service station should enter in the office of the secretary of the Automotive association the distinguishing marks used on its rental batteries. In order to accomplish this a postal card vote is being taken asking each service station to express its opinion as to whether or not this plan is feasible and workable. The present indications are that the vote will be favorable. If so, each station will be forwarded a small piece of wooden veneer on which it will be asked to paint, stamp or cut the proper colors, and other distinguishing marks which identify its batteries from those of other stations.

These will be filed in the office of the secretary and a telephone call from any service station at any time will serve to identify the ownership of any battery which comes into that station for recharging or other work. That, it is believed, will prevent renting owners from retaining in their possession for an undue period batteries which are rented.

As soon as this registration is completed, the association will attempt to install a new system of rental battery identification in this manner: Each station will be assigned a number and branding irons will be purchased by the association with these numbers on them and the irons will be sold to the various service stations so that eventually a uniform number branding system will be installed throughout the community on all rental batteries of all makes. It is hoped that this latter system will be more effective than the former because it is extremely difficult for the various battery men to remember the present types of identification, whereas the numbering system can be easily catalogued and each battery station furnished with a copy.

The reason for first registering the distinguishing marks which are now in existence rather than attempting to put in the number branding system immediately is to get an immediate check on the battery rental business.

LOS ANGELES DEALERS PLAN OUTING

Los Angeles, April 25—The annual outing of the Motor Car Dealers' association is scheduled for Catalina Island, May 15. Arrangements are in charge of a committee and the plans are being kept secret. The election of officers will be held at this time and reports made on the activities of the association for the past year. Aside from this no other business is transacted the occasion being one for recreation only. Two days will be devoted to the expedition.

PLAN LONG WATER SHIPMENTS

Los Angeles, April 24—Freight shipping conditions are such that one of the leading motor truck companies here, with branches at San Francisco, Portland and Seattle, is making arrangements to transport trucks from an Atlantic seaboard to its Pacific coast points by water. This would be the first time an undertaking of this kind had been attempted. A steamship company guarantees to make the shipment from New York to Los Angeles in twenty-eight days. This is no longer than it is required frequently to cover the distance by rail and the cost of transportation would be less.

NEW LIGHT LAW IN WISCONSIN

Milwaukee, Wis., April 26—A new code regulating motor car, truck and trailer illumination, drafted by a committee of experts appointed by the Industrial Commission of Wisconsin will become effective May 1 throughout Wisconsin. The principal features of the code, which has the effect of a state law, are to set up standards which will eliminate glaring headlights, and to prescribe a minimum as well as a maximum of intensity.

CHARLES SCHWEINERT PROMOTED

New York, April 24—M. Charles Schweinert has been elected president of A. Schrader's Sons, Inc. Mr. Schweinert entered the employ of the company thirty-four years ago as an office boy.

Columbus Truck Tour Starts with Good Circumstances

COLUMBUS, OHIO, April 27—The motor truck tour under the auspices of the Columbus Automobile Trade association, started out bright and early Monday morning, April 19, to continue for the entire week. In all there were fourteen trucks that participated in the tour which was under the management of C. S. Magruder, secretary-manager of the association. A. R. Kroh, an expert on farm information, accompanied the caravan and delivered lectures on farming at the various stops. Demonstrations of the use that motor trucks can be put to on the farm were made at all stops.

The first stop was at Ashville where the caravan was welcomed by the mayor and city council. Later stops were made at Circleville, Lancaster, Somerset, Zanesville, Newark, Mt. Vernon, Mt. Gilead, Delaware, Marysville, London, Washington C. H. and Mt. Sterling. In addition a number of shorter stops were made at smaller towns.

Two army recruiting trucks, one bearing a powerful searchlight accompanied the tour. The trucks used were: Armleder, Republic, Oldsmobile, Reo, Clydesdale, Ford, International, Sterling, American, Packard, Nash, and White.

The committee in charge consisted of Frank H. Girard, chairman, E. C. Brisley and John A. Howe.

FEAR ORGANIZED BAND OF THIEVES

Columbus, Ohio, April 25—The Columbus police department is trying to cope with what appears to be an organized band of motor car thieves which has been stealing a large number of cars in the Buckeye Capital. During March a total of thirty-nine cars were stolen of which only a small percentage was recovered. Recently the police had a pistol battle with three thieves and chased them through the crowded downtown section. All were landed behind the bars. One of the thieves was badly wounded.

Service Plant Valuable In Downtown District

Convenience to Customers Pays Increased Cost of Rent, According to Buffalo Dealer

BUFFALO, April 25—Value of the downtown service station, separated from the sales room and offices of the modern automobile business, can not be overestimated, according to Mason B. Hatch, Buffalo distributor, who has just inaugurated business district service.

Mr. Hatch has a modern salesroom and service station together with offices at 1253 Main street, in Automobile Row, but two miles from the lower business district of Buffalo. He has now opened a service station at 746 Washington street, within quick walking distance of the heart of the business district.

"Down town service is a feature that the busy man appreciates," Mr. Hatch said. "Suppose the motorist starts for his office and finds his car running improperly. He leaves it in the down town service station, is at his office after a few minutes' walk and finds his car ready for him when his day's work is finished. Not only is his time saved but so is that of the service station mechanic, who otherwise might have to drive the car to the owner if this was desired.

"The down town service station requires capable men and equipment to care for all kinds of work quickly and well."

The new Hatch service station has approximately 150,000 square feet of space. The main plant of the company will continue to be salesroom for the Chandler and Cleveland cars.

KETTERING TO ADDRESS S. A. E.

Indianapolis, April 26 — C. F. Kettering, president of the Dayton Engineering Laboratories Co. and formerly president of the S. A. E., will address the Indiana Section of the S. A. E. on "Developments of the Fuel Problem." During his talk he will demonstrate by actual operation some of the peculiar properties of fuels when introduced into the combustion chamber of the automobile engine. Announcement of the meeting states that the experiments shown will be novel and surprising and in view of the recent talks given by C. F. Kettering on this subject, a very interesting meeting is anticipated. Mr. Kettering has in his laboratories gone into considerable research work on automotive fuels.

It is stated that Maj. Schroeder, in his recent altitude record, utilized some of the results of the C. F. Kettering experiments. Mr. Kettering has developed an entirely new theory for what has hitherto been considered the causes of fuel knocks in automotive engines and the coming lecture on this subject at the Indianapolis meeting is regarded as of particular interest, in view of Mr. Kettering's experiments on the characteristics of different automotive fuels which are now in use, or are possibilities for use in the immediate future. The meeting will take place on April 30 at the Hotel Claypool, Indianapolis.

CONVICTS CLEAR NEW YORK ROADS

Buffalo, April 26—Tractors and prisoners are the combination which finally cleared New York state roads of the huge snow drifts which for weeks closed the majority in the upper portion of the state to automobile traffic.

Tractors, including army equipment, finally broke through the huge drifts after many motors had been stalled in the attempt. Near Mayville drifts twenty-two feet deep were reported, while piles of snow seven to ten feet deep were common. Prisoners from the Niagara County jail were impressed into road clearing service between Lockport and Millerport.

Detroit, April 24—A new issue of the Auto Electrician's Guide, a book of wiring diagrams, has been published by the Michigan State Auto School. The book contains more than 900 diagrams.

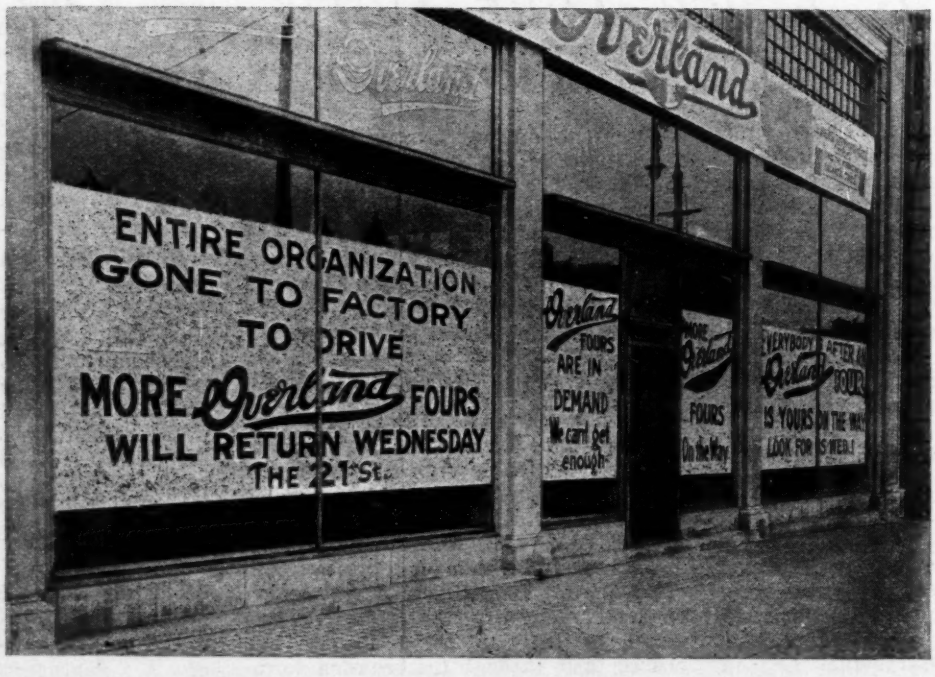
First Convictions Are Obtained Under Dyer Act

Three-year Sentences Meted Out to Thieves by Detroit Judge Under New Statute

DETROIT, April 23—Three years in Leavenworth was the sentence assessed against Robert Edwards, the first man to be tried in Michigan charged with violating the Dyer law fixing penalty for transporting stolen automobiles across the state boundary. Edwards pleaded guilty to the charge of stealing a car in Detroit and selling it in Toledo.

The penalty imposed on Edwards in the opinion of car owners will have a wholesome effect in minimizing thefts. In imposing sentence Judge Tuttle announced that where he found it advisable to impose a fine it would not be under $1000 in any case. Assistant District Attorney Frank Murphy said he believed the sentence on Edwards would have the effect of putting an end to the theft of cars in Michigan with the idea of disposing of them in other states.

It is not an easy matter to dispose of stolen cars in Michigan, but up to the time of the passage of the Dyer law thieves reaped a rich harvest in disposing of cars in Ohio, Indiana and Canada. Even the passage of the Dyer law did not frighten them as was evinced in the case of Edwards, who said he expected to get off with a fine by entering a plea of guilty. The determination of the courts, however, to disregard guilty pleas and fix lighter punishments, as is usual in ordinary procedure, is expected to prove a set back. In the action in the Edwards case car owners see the beginning of the end of thefts.



Getting cars delivered is one of the big problems of the motor car dealers these days. A Boston dealer finally solved the problem by closing his salesroom and taking his entire organization to the factory to stage a big driveway

HARTFORD GAS MEN COMBINE

Hartford, Conn., April 26—For mutual advantage all the gasoline filling station operators in Hartford have organized the Petroleum Club of Hartford. The filler station men assert that the refiners through their own stations want to drive them out of business. Hartford is, as a matter of fact, becoming quite a sizeable depot for the refiners. All filling stations are retailing gasoline at 31 cents a gallon, but most of the garages are selling at 32 cents. The stations are increasing.

Texas Booze Smuggling Aided by Motor Vehicles

Prohibition Officers Find a Well-Camouflaged Car Carrying the Illicit Kick

WICHITA FALLS, Tex., April 25—It is stated by officers who are employed in enforcing the prohibition laws, state and national, in Texas, that the automobile is the chief means of carrying on the illicit traffic of bringing intoxicating liquors into the state and distributing the contraband goods to the "bootleggers" and consumers. Scores of automobiles along the highways and country roads leading into the interior from points on the Mexican border are searched daily and many have been the discoveries of whiskey and other intoxicants in these vehicles. The principal source of this supply is Mexico. It is known that enormous quantities of various kinds of intoxicating liquors are smuggled across the Rio Grande daily.

All sorts of devices are used by the men who are employed in the unlawful traffic to conceal their automobile cargoes. One of the most remarkable of these cases came to the attention of the local authorities here a few days ago. For some time efforts had been made to capture a man and automobile that were known to be hauling high grade whiskey from a point on the Mexican border to the oil fields of this region, where the liquor was sold readily for big profits. The tip finally came to the peace officers that this notorious automobile was again on its way to Wichita Falls. It was learned that it was expected to enter town on a certain road on a certain night. W. M. Belcher, deputy constable, and other officers, were sent to intercept the automobile and driver.

It was left to Belcher to make the capture. He was only able to do so after an exciting chase in his car, and the firing of several pistol shots at the fugitive, finally bringing him to a halt. The man refused to give his name. He insisted that there was no whiskey in his car. It took Belcher and the other officers two hours to locate the receptacle where the illicit liquor was secreted.

The car was a Dodge roadster, 1917 model, with a New Mexico license tag. All of the interior under the seat and rear cover had been torn away and a huge tank installed securely. It was necessary to remove the seat and back cover and lift up a section of tin before the tank could be reached. Even then the opening to it was a mystery. After more than two hours the officers removed an innocent appearing screw, and thus were able to get to the contents.

It proved to be rye whiskey of high quality, twenty gallons or more. There was a slight crack in the top of the tank and the constant jolting had shaken out some of the contents, giving the car a strong odor. The rear gasoline tank had been divided by a circular sheet of metal soldered in place and half of the tank also contained liquor. It was detected by a duplicate filling plug, the end of which was hung as a "blind" beneath the car.

Officers estimated that several hundred dollars had been spent in altering the machine. Its appearance in no respect was suspicious.

SPOHN WITH FULLER COMPANY

Chicago, April 27—Howard Spohn, formerly associated with The Class Journal publications, and Frank A. Kapp, formerly with the Motor Print Co., have associated themselves with Charles H. Fuller, advertising agents, in Chicago.

NEW JOBBING FIRM ORGANIZED

Chicago, April 22—E. V. Swanstrom, associated with various automotive accessory manufacturers for the last fifteen years, has organized his own company, the Swanstrom Sales Co., to sell to the jobbing trade exclusively. The company will handle Arnold electric tools, Cleroline, Derf spark plugs, Hindview mirrors, Holoplane lens, Perma-Loc products and the Steiner Hydrokit.

Uncle Sam had to keep Washington supplied with food even if he couldn't get anything over the railroads. Above is a lineup of trucks before the postoffice waiting to go into the country to gather food supplies

Southern Dealers Plan Truck Boosting Campaign

Georgia Motor Men Outline Extensive Program to Popularize Vehicle for Farm Work

MACON, Ga., April 25—Motor trucks for Georgia farms are coming with the better roads. All over the southeast paving of highways is in progress, especially in Georgia, and naturally the famous Georgia mule is beginning to see his finish. In his place are motor trucks and farm tractors, and almost every farmer in this section of the cotton belt owns one automobile and some own more. It is a remarkable change which one sees taking place throughout this section of the country, and is due to good roads and to the high cost of feed for the mules. Gasoline is cheaper than mule feed, a farmer will tell one, and motor equipment will produce more than the same investment in mules, he also will affirm.

The development of the farm tractor and motor truck trade in this part of the country has been rapid. It gained its impetus last year when the first national farm tractor demonstration ever held in Dixie was staged here; then it was followed by the motor truck demonstration, three one-day tours being run out of this city over different routes and all operated on the same day.

Now there is to be another tour, seven day event over a greater territory, to demonstrate to the farmer that the motor truck is the thing for him, if he has not learned this already. The tour will start from this city on April 26, which is Southern Memorial day, and this is the circuit that is to be chosen, many of the towns being in the famous peach belt of Georgia; Bolinbroke, Forsyth, Barnesville, Yatesville, Thomaston, Butler, Reynolds, Montezuma, Marshallville, Fort Valley, Perry, Byron, Gray, Bradley, Wayside, Round Oak, Hillsboro, Monticello, Eatonton, Milledgeville and Haddock.

HEADS STUDEBAKER ADVERTISING

South Bend, Ind., April 24.—A. S. Barrett has been appointed advertising manager for the Studebaker Corp., with headquarters here. He succeeds R. C. Sackett now a distributor.

"Jack" Prince Looks Over Texas with Eye to New Speedway

DALLAS, Texas, April 24—John S. (Jack) Prince, president of the Prince Speedway Construction Co., who recently paid hurried visits to Dallas and Fort Worth with the view of investigating the proposition of building a speedway at Dalworth Park, situated midway between the two cities, expressed himself well pleased with the project.

He announced that he will build a mile and a quarter board speedway, with grandstands, etc., and put on a contest annually between internationally known drivers, for which his company will offer $25,000 in purses and bear all expenses, if Dallas and Fort Worth each will guarantee to sell 500 tickets at $100 each, good for admission of the purchaser and wife to all speedway events for a period of ten years. Fort Worth parties, he said, had offered every encouragement, but because of the lack of time he was unable to get in touch with Dallas enthusiasts.

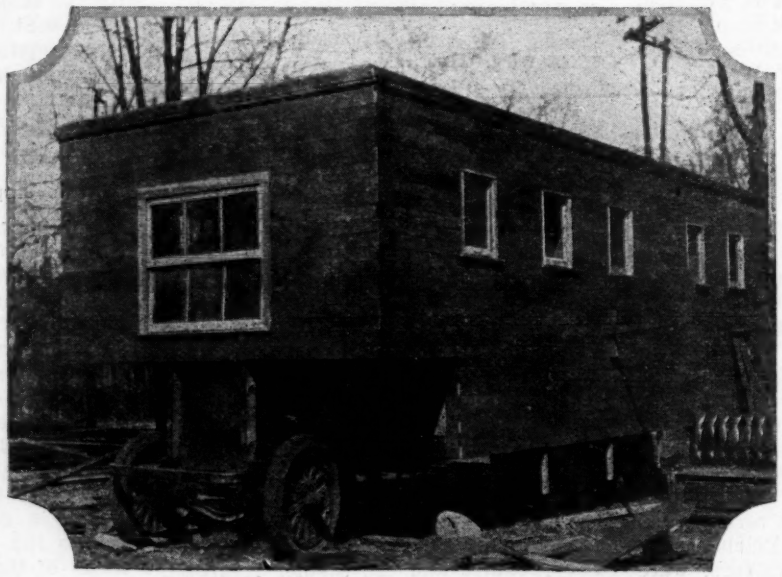
Mr. Prince has built speedways at Des Moines, Omaha, Uniontown, Pa., and more recently one at Los Angeles. He now has one under construction at Havana, after which he will build a speedway at Philadelphia and also at San Francisco. He says he will then be free for an engagement at Dalworth.

On these speedways, Mr. Prince said, will be staged the National Grand Speedway circuit, operating from New York to Los Angeles during the spring, and from Los Angeles to New York in the winter. The winner will be awarded prizes according to the number of races won upon each of the speedways and not upon one speedway alone.

TELL OF BOULEVARD BUILDING

Indianapolis, April 24—That its new general offices will not detract from the appearance of the Indianapolis boulevard system is the reply of the Craig Hunt Motors Co. to recent agitation seeking to bar the erection of the building on these grounds. Park commissioners of Indianapolis are said to have disapproved of the motor company's building program in that it would be unsuitable to boulevard.

The new building which the company proposes to build at the intersection of Meridian street and Thirty-eighth Street Boulevard is to house the general offices of the concern and, temporarily, its sales and assembling plant. The company has plans under way for the purchase of ground in a different part of the city, which is to be utilized for factory purposes. Photographs of the new building indicate that the company's stand is reasonable.



To solve the housing problem, William Travers, an electrical engineer of Cincinnati, built the above three-room house on a motor truck chassis. The portable flat has all modern equipment, including electric lights, gas, bath and running water

KANSAS CITY ENLARGES FIELD

Kansas City, Mo., April 29—The Kansas City Motor Car Dealers' Association is extending its usefulness this year, a particular phase of expansion being the establishment of special committees and perhaps a special division for truck interests. Heretofore all the business of the association, which serves both passenger car and truck distributors, has been transacted by means of the same machinery of the organization. The resignation of E. E. Peake, which was not accepted, precipitated several plans for heavier work. Mr. Peake will continue secretary, but an assistant secretary has been appointed, E. R. Coleman, who has served with Mr. Peake throughout nearly the entire seven-year period of the widely-known secretary's tenure of the Kansas City office.

DANVILLE DEALERS ORGANIZE

Danville, Ill., April 24—The Vermillion County, Ill., Automotive Dealers association, was organized at a meeting held in Danville April 8. Officers were chosen as follows: President, Harry L. Snyder; vice-president, Edward C. Kurman; secretary, Daniel Beckwith; treasurer, Alden H. Parker. The officers are all from Danville. Directors chosen included Wade Holton of Sidell, Barton Parrish of Allerton, Edward Hall of Hoopeston, and W. H. Goodwine of Potomac. Eighty dealers filed applications for membership and it is hoped to increase the number to one hundred. J. C. Thorp, Ray Sparks, McCurdy Spang, and A. A. Cuppy, all dealers of the Champaign association, were present and assisted in the organization. It was voted to affiliate with the new state association, organized recently at Springfield, and also the national association. The new association has the largest membership of any of those in Illinois outside of Chicago, and is said to be the only one in the state where the county as well as the city dealers, were invited to membership.

OPENS SCHOOL FOR FOREMEN

New Holstein, Wis., April 28—A school for foremen and other supervisory executives has been opened by Factory Manager Edens of the Johns Lauson Mfg. Co., makers of a kerosene tractor and gas and gasoline engines.

"You foremen are the steering gear and controls of production," said Mr. Edens at the opening session of the course. "Whatever the operating management desires to do, in whatever course it wishes to run production, it must guide and direct through you. The management controls the machinery and power of labor through you."

The object of the course, as explained by Mr. Edens ,is to improve the relations of the management with the foremen and through them with the men. It is believed that by developing in the foremen a wider outlook not only on the functions of their own departments but also on the work of the whole plant and of industry in general, they will become more efficient in production.

The course is being studied by forty-nine of the supervisory force including assistant superintendent, production manager, store keeper, foremen, general foremen, cashier, president, cost clerk, etc. These men meet regularly to discuss the fundamentals of modern industry and to apply them to the man's every-day problems.

WHAT DOES M. O. F. E. MEAN?

Fort Dodge, Ia., April 26—The Elks and the Eagles have a rival out here in Fort Dodge. It's the M. O. F. E. There's no use asking what the cabalistic letters stand for, because even the members are making pools on it. The men who evolved the idea know, but they won't tell.

The M. O. F. E. has a mission in life, but it isn't high brow stuff. The idea germinated in the brain of A. C. Heath, president of the Fort Dodge Automobile Dealers' association. He got tired of calling meetings to take up pressing problems and having to adjourn because there wasn't a quorum.

Mr. Heath went on the theory that there is a solution for every problem. He knew fraternal organizations seldom were troubled in the same way and concluded it was because they mixed fun and pleasure with business. When he reached that point in his reasoning the M. O. F. E. was born.

The business, however, is purely incidental. The main purpose of M. O. F. E. is to increase and develop friendships among men in the automotive industry, for they are the only ones eligible to membership. Only the reputable ones can get in.

M. O. F. E. will strive to promote recognition of the worthiness of legitimate dealers and to encourage high ethical standards in their business. It will stimulate the desire of its members to be useful to each other and to the community in civic, social, commercial and industrial development.

SCRUTINIZE ADVERTISING SIGNS

Columbus, O., April 23—Advertising signs posted along Ohio highway which resemble the "stop, look and listen" signs of the Ohio Highway Commission must all be torn down according to a recent order of the commission. This action was taken after securing an opinion from the Attorney General holding that the Ohio Highway Commission had authority in the matter.

Barney Oldfield Is Latest to Enter for Indianapolis 500-mile Race

INDIANAPOLIS, April 29—Barney Oldfield, "the race driver who never looked back" has entered a car in the speed classic to be held at the Indianapolis Motor Speedway, May 31. The veteran of eighteen years in the racing game will elect another pilot to handle his mount this year as in 1919 when he sent Roscoe Sarles to the wire with his entry. Who Oldfield's choice will be this year is a matter of conjecture—he has not yet announced, and whether he has decided is not known.

The car he has entered is an "Oldfield Special" of 182 cu. in. piston displacement manufactured by Harry Miller, of Los Angeles. That is all the information that was contained in the official entry blank turned in to the Speedway officials. In last year's race Oldfield's car was eliminated early in the game with a broken cam shaft, but Sarles kept it well up in front as long as it was in the affair.

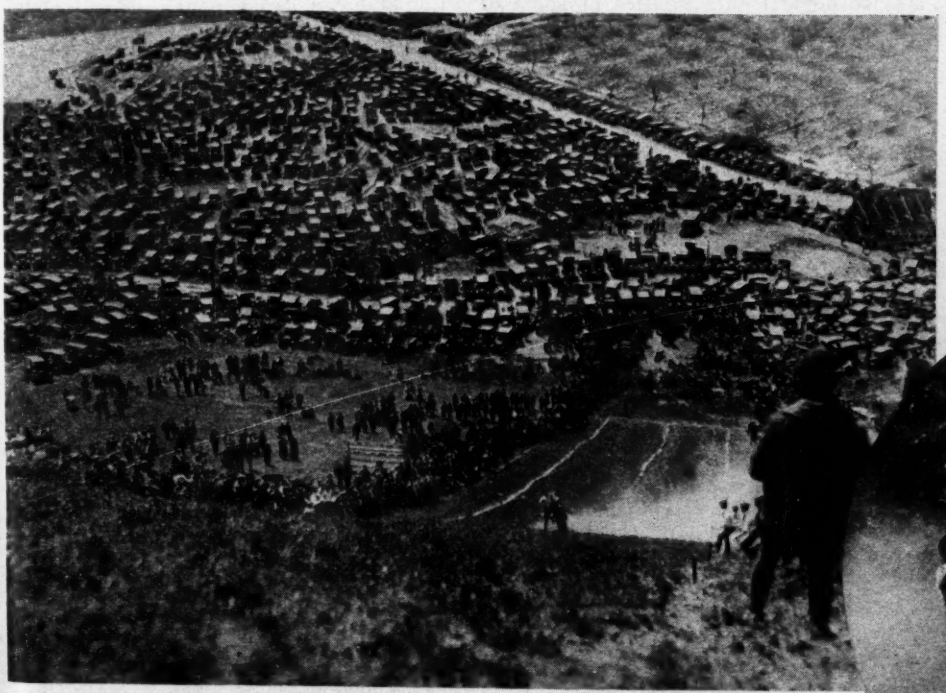
Barney Oldfield is a fixture in the history books of auto racing. He was the first man to drive a mile in less than a minute on a circular track; that was here in Indianapolis in 1903 when he covered the distance in 59 seconds, for which he was paid $100, the second year of his racing career. From that time on, until his retirement from actual competition, he was constantly in the limelight as a speed merchant.

"Old Master," as he is commonly known, got his first taste for fast riding when he placed second in a bicycle race in 1894, when he was eighteen years old. In 1899 he gained his first experience as a pilot of motor cycle racing machines, at which he became a leading expert. It was in 1902 he joined Tom Cooper, former national bicycle champion, and Henry Ford, then an obscure engineer, becoming the driver of two racing cars designed by Ford and financed by Cooper.

It was on September 21 that he drove and won his first race, when steam, gasoline and electric cars from all parts of the country gathered for the five mile event at Grosse Point track, Detroit. He defeated a large field for a diamond trophy, pacing a Ford 999 the distance in 5:20, the world's record at that time. Oldfield drove the first American car to finish the 500-mile International Sweepstakes at the Indianapolis Motor Speedway in 1914, when he placed fifth in a Stutz, averaging 78.15 for the distance. He was also fifth in 1916, driving a Delage. The veteran race driver is always a popular figure at the Indianapolis Speedway and he will spend some time here grooming his car and driver for the big event in May.

FIGHT AGAINST REPAIR LICENSES

New York, April 24—Members of the Automobile Dealers' association, Inc., of New York City, are up in arms over a bill which has recently been introduced in the New York legislature seeking to license repair shops and service stations.



California continues to be the real home of motor racing contests in the United States. While other parts of the country are closing their speedways because they are financial failures, Los Angeles this year opened a new one which bears every promise of being a tremendous success. These photographs, which show the tremendous crowd at some recent motorcycle hill climbing contests, show why racing is a success on the Pacific Coast. In the circle is a near-accident which attended the contest

While outwardly this bill is merely a revenue-raising measure, its provisions are such that it constitutes a distinct menace to the automobile industry.

The bill provides that all service stations and repair shops be licensed by the Secretary of State, specifying a charge of $25 per license. The inimical portion of the bill, however, is a provision which states that licenses may be revoked upon proof to the licensing authority that an automobile has suffered gross negligence or willful injury while in the custody of such a shop.

In fighting the bill the dealers' association points out that its provisions would lay open repair shops to grave injury from any disgruntled customers. It declares that it would not drive out of business the dishonest repair man, but would seriously injure the honest service man who might get into disputes with his customers over charges.

WILCOX NOW COLE ENGINEER

Indianapolis, April 24—"Howdy" Wilcox, winner of last year's Indianapolis Sweepstakes, and one of the best known and most popular racing drivers in the United States, has been appointed research engineer for the Cole Motor Car Co. Wilcox got his first automobile experience with the National company, and more latterly has been engaged in the taxicab business in Indianapolis. His work for the Cole company will be along experimental lines.

NEW ACCESSORY FIRM FORMED

New Orleans, April 24—The former Original Wrecking Auto Co., one of the largest motor car wrecking concerns in the United States has been reorganized under the name of the New Orleans Auto Supply Co. with a fully paid up capital of $40,000. The company will engage in the wholesale and retail supply business.

NEW SERVICE FIRM ORGANIZED

Chicago, April 24—"The Courtesy Service & Sales Co." is the attractive name which has been adopted by a local concern. The Courtesy company will handle all Berling magneto sales and service for Chicago and the vicinity.

STRIKE HITS ENGLISH FACTORIES

New York, April 27—The molder's strike in Great Britain has seriously interfered with deliveries here of Sunbeam cars and Dario Resta, the American distributor, probably will not have more than fifty instead of the expected 100 cars to market in 1920. Twenty of these have been received. Despite the curtailed supply, Resta has appointed some distributors in three cities, these being Durant in San Francisco, Caldwell in Boston, and Brainstetter in Chicago.

HARLAM NEW SERLIN DISTRIBUTOR

Chicago, April 24—J. H. Harlam has been appointed distributor in Chicago for the Serlin Tire Co. He formerly was associated with the Acorn Tire & Rubber Co.

Factory Service Men to Convene in May At Indianapolis

NEW YORK, April 26—Factory service managers from all parts of the country will hold a convention at Indianapolis May 24, 25 and 26. The convention will be under the direction of the Service Committee of the National Automobile Chamber of Commerce and is intended as a follow-up to the Service Convention which was held last November in Detroit.

The service conventions are not a new departure for the Chamber, but rather the taking up of the reins where they were laid down at the time this country went to war. Several were held some years ago, but the Detroit meeting marks the first of the post-war conventions. As a starter, the first one necessarily dealt with service in a broad and general way, covering so many phases of the subject that not very much could be done on any one thing. But it started the ball rolling and now the second post-war convention will get down to brass tacks. Boiling the activities of the subjects down to a single sentence, the effort will be "to get a better conception of service on the part of all parties concerned," meaning the manufacturer, dealer and owner.

The first two days of the convention will be devoted to the reading and discussion of a number of papers, the first day's subjects being "Service considered from outside the service department." The following day the talk will turn to "Service considered from inside the service department." Titles of some of the papers will be, "Salesman's responsibilities in connection with service"; "Owner's responsibilities in connection with service"; "Methods of estimating charges for service"; "Repairshop efficiency methods"; "Stockroom efficiency and sales methods."

It is probable that there will be some talk about new service division of the National Automobile Chamber of Commerce and a definite plan of action may be decided on.

Al Reeves will be chairman of the daily sessions and L. C. Voyles, service manager of the Nordyke & Marmon Co., and president of the Automotive Service association of Indiana, will be in charge of the trips on the third day.

The Service Committee consists of E. T. Herbig (service) chairman; H. W. Drew (Packard), W. M. Ladd (Pierce-Arrow), A. B. Cumner (Autocar), W. M. Britton (Republic), O. T. Hillshafer (Chandler), W. B. Riley (Jordan).

STUDENTS TO DRIVE BOSTON CARS

Boston, April 25—Automobiles will be driven from western cities to Boston by twenty-eight technology students in an effort to relieve the congestion caused by the railroad strike and the consequent tie-up in freight congestion. Wallace Ross, secretary of the Technology Christian association, made the announcement.

This came in response to letters from several automobile manufacturers asking if men could be procured by the local organization for this kind of work. Twenty-two men will pilot cars from Flint, Mich.; four will drive from Cleveland and two from Indianapolis.

TO ENFORCE MIRROR LAW

Boston, April 25—In respect to automobile discerning mirrors, complaints received at the registry of motor vehicles at the State House prompted Registrar Frank A. Goodwin to send the following notice to all police departments within the commonwealth:

"Reports are constantly coming to this office of the widespread violation of Chapter 212 of the general acts of 1919 requiring mirrors to be attached to taxicabs, commercial motor vehicles or motor trucks so constructed, equipped or loaded that the driver or operator is prevented from having a constantly free and unobstructed view of the highway immediately to the rear. It would seem that owners of above mentioned class motor vehicles have had sufficient time to comply with the law and I am calling the matter to your attention for such action as you may deem proper."

MUST REMOVE ROAD AD SIGNS

Detroit, April 27—Advertising signs along the public highways probably will be removed under a law passed by the legislature, giving the state highway department that authority. Trunk line highways throughout the state will be marked completely in the near future by the highway department, under legislative enactments. Standard markers, a design for which was selected last year will be used and each road will be posted according to its trunk line number, so that with the aid of a small map the tourist can follow these numbered routes to any part of the state. Frank F. Rogers, state highway commissioner, announced this week that action in removing advertising signs and re-marking the roads would be taken up immediately.

TO EDUCATE TRUCK OWNERS

Cincinnati, O., April 24—Because the average purchaser of a motor truck does not study his transportation needs and often does not use the right truck in the right place, the newly organized Cincinnati Motor Truck Dealers' association has inaugurated an educational campaign for better truck operation.

To get its message to the owners of trucks, the association will issue booklets in which the daily operation expense can be jotted down, so owners may know just how much it costs them to operate their trucks. The association will also issue a series of publicity pamphlets which will aim to show the right truck in the right place.

The campaign is planned for the purpose of correcting overloading and

other abuses that are so common to the motor truck.

If the highways were muddy according to the latest advices and 1.12 in. (2.25 in. minus 1.13 in.) have fallen since the latest report the roads will be very muddy. If the roads were very muddy and 1:32 in. fell (3.57 in. minus 2.25 in.) the roads will be impassable. The above plan is very important in the winter time when small amounts of precipitation make important changes in highway conditions.

Mud is the largest factor in causing impassable conditions. Other causes of impassability are overflowed lands, high streams interfering with the operation of ferries, washing of gullies, washing away of small bridges, high streams preventing fording, and the delays caused by construction work. These can be determined only from reports of persons on the ground where the impassable conditions obtain.

SELLS CARBURETERS NEW WAY

Hartford, Conn., April 26—Two enterprising young men in Hartford who conduct a repair shop and service station, recently took over the agency for a well-known make of carbureter. They soon realized that while customers would listen to them when they said they had installed their carbureter on a certain make of car, there was an inclination on the part of the prospective buyer to be shown. Accordingly, all the old carbureters were gotten together and all that could possibly be crowded over the office door were set in place, together with manifolds and other fittings. As a sales argument the display on the wall is very effective. It has clinched the sales talk and it has been necessary for the young men to order in substantial quantities.

ARKANSAS ASSOCIATION EXPANDS

Little Rock, Ark., April 29—The Arkansas Automobile Dealers association has amended its constitution in order to extend membership to the entire automotive interest of the state. Accessory, tire and battery dealers are now admitted into full fellowship. Automotive associations have been created in Hot Springs, Pine Bluff, Dermott and other Arkansas cities. These are all affiliated with the state association which is now planning an active campaign for increased membership in order that needed reforms may be made in the business during the year. F. L. Reed of Little Rock is president of the state association.

GOODYEAR BUILDS RIM PLANT

Akron, O., April 25—Goodyear Tire & Rubber Co. has begun construction of a rim plant to be housed in a one-story brick and steel structure 250 by 660 ft. and to have a capacity of 10,000 rims e day. The plant will employ 500 workmen at the start. Contracts for the buildings and machinery were let some time ago, but weather conditions delayed construction. Steel and a large part of the rim-making machinery is on the ground.

Motor Car Credits Now Are Stable Article Says Georgia Banker

MACON, GA., April 25—In a discussion of credits, as they apply to automobile and motor truck companies, before the Macon Automobile Dealers' Association at its monthly meeting this week, Hatton B. Rogers, vice-president of the Fourth National bank, the biggest bank in middle Georgia, and one of the biggest in the Southeast, gave a bit of advice which dealers think would be of interest in other sections of the country.

"Automobiles and motor trucks are no longer a luxury," said Mr. Rogers. "I can remember when automobile credits were considered hazardous, but now cars and trucks are looked upon as a staple article, just the same as groceries."

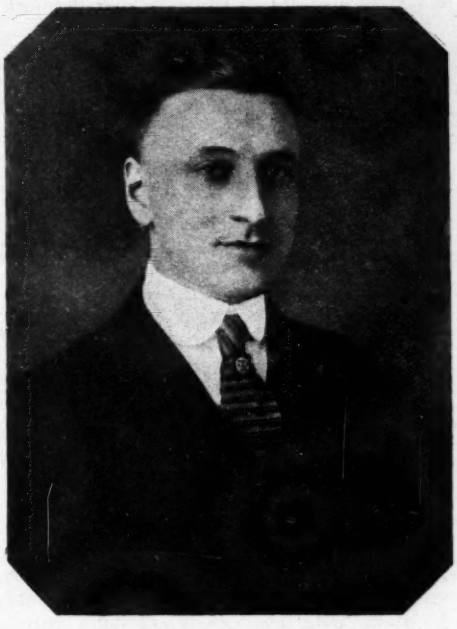
He gave statistics showing the annual production and showed that it had been figured that it took a car six years to go from the factory to the junk pile. Three essentials, he said, were considered by a banking house in passing upon the credit of an agency: Character, capacity and capital.

Mr. Rogers warned his hearers against an over-indulgence in used cars and suggested a remedy that there be closer co-operation of the dealers.

"Your business is in handling new machines," said Mr. Rogers. He urged dealers not to tie up their profits from the sale of cars, the old cars taken in exchange.

Plans were completed at the meeting for the automobile, truck, tractor and accessories show to be staged here May 6, 7 and 8. Dealers say that it will be the biggest event of its kind in the Southeast this spring, and in fact the only one so far as known at this season of the year.

NEW ILLINOIS SECRETARY



Fred C. Zillman was last week appointed secretary of the newly organized Illinois Dealers' association. Mr. Zillman has had considerable experience as a field worker for the National Automobile Dealers' Association

TIRE CHAIN PATENT EXPIRES

New York, April 26—Life of the famous patent of Harry Parsons, known technically as No. 723,299, under which the Weed tire chains have been made for seventeen years, expired on March 24. Predictions of what will happen in the chain market as a consequence are unsafe. The American Chain Co., which succeeds the Weed Tire Chain Co., and purchased the Weed holdings several years ago, declined to-day to go into details as to its plans in this respect. It is expected, however, to continue its present manufacturing policies.

SOUTH HAS STATE MOTOR SCHOOL

Wilmington, N. C., April 24—Wilmington had for some time had the distinction of having the first and only automobile school in North Carolina. This school has been giving free instruction in the construction, operation and maintenance of automobiles and motor trucks, and, because it is a free school, open to the public, the state department of public instruction has taken it under state supervision under the Smith-Hughes act.

The Monday evening classes are for owners and women, and many of the latter who propose to or are driving their own cars, are attending. George W. Coggins, state supervisor of schools, was in Wilmington last week and made an address to this school, in which he affirmed the determination of the state department to take the school over and maintain it.

The institution has been known heretofore as the McMillan Automobile school.

ATLANTA GETS NEW CAR PLANT

Atlanta, Ga., April 25—An automobile plant costing $250,000 is to be begun here within the next few weeks by the Simms Motor Car Corp., recently incorporated with a capitalization of $2,500,000. The company expects to begin production about August 1 of the Simms motor car, a popular priced car retailing at about $1,200.

The daily output of the plant at the start will be twenty-five cars, but the company expects gradually to increase this output to 100 cars daily. The company will employ from the start between 500 and 1000 employees.

The officers of the new company are: Thomas H. Mars, president; Jackson H. Simms, vice-president and general manager of sales; E. W. Van Duzen, vice-president and chief engineer; Harry L. Innes, production manager, and Earle M. Donaldson, secretary and general counsel.

STEARNS TRACTOR ENGINE

Type of Engine That Is Fast Coming to the Front in the Tractor Field

THE Stearns tractor engine, made by the Stearns Motor Mfg. Co., Ludington, Mich., is a development of a type engine that seems to be coming to the front very rapidly in the tractor engine field, because of its clean cut design, overhead valves, and complete inclosure. The engine has four cylinders, of 4¾ by 6½ in. bore and stroke, and develops 41 hp. at 800 r.p.m., and at 950 r.p.m., 47 hp.

The cylinders are block cast and are made of grey iron with barrels reamed and accurately ground to size. The combustion chamber is reamed to within .002 in. in diameter, which insures uniform combustion in each cylinder.

Removable Cylinder Head

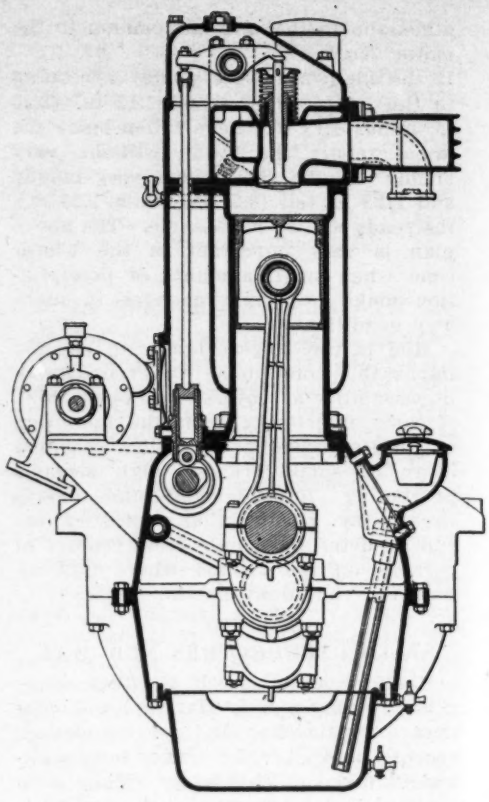
The removable cylinder head is made of the same quality of grey iron as the cylinder and is bolted to the cylinder with fifteen $\frac{9}{16}$-in. studs. Exceptionally larger water space is provided for, and the gas inlet passage is of absolutely uniform shape and size throughout its entire length, thereby insuring correct carburetion with a minimum amount of fuel. It is also so designed that it follows the heated exhaust passage, which assists this carburetion. The valve-stem guide bushings are pressed into the cylinder head and can easily be replaced when worn.

The crankcase is made of grey iron and is designed to give maximum rigidity with minimum weight. The main bearings are tied to the side walls with exceptionally wide flanges, and are supported with two heavy ribs. The bearing caps are set in a recess ½ in. deep and held in place by four ⅝-in. studs. Two large inspection holes are provided on one side of the crankcase, covers of which can easily be removed and through which all bearings can be inspected.

The crankcase is made in two pieces, the lower half of which acts as an oil reservoir and also contains troughs for connecting rod tips. These covers are so designed that all bearing adjustments can be made by removing simply the lower half. This can be removed without interfering in any way with any bearings or oil piping.

The crankshaft is made of chrome nickel-steel treated with bearings accurately ground and lapped to size. The shaft is also accurately balanced on a Norton crankshaft balancing machine. Large oil holes are drilled through the shaft for lubricating the connecting rod bearings. An oil throw is provided on the front and rear end, eliminating the possibility of oil leaks to a minimum.

The connecting rod is made of 0.40 carbon steel heat treated to give maximum strength. The connecting rod cap is held in place with four ½-in. chrome vanadium steel heat treated bolts and special extra long nuts. The wrist pin end of this rod is arranged to hold a bronze wrist pin bushing.



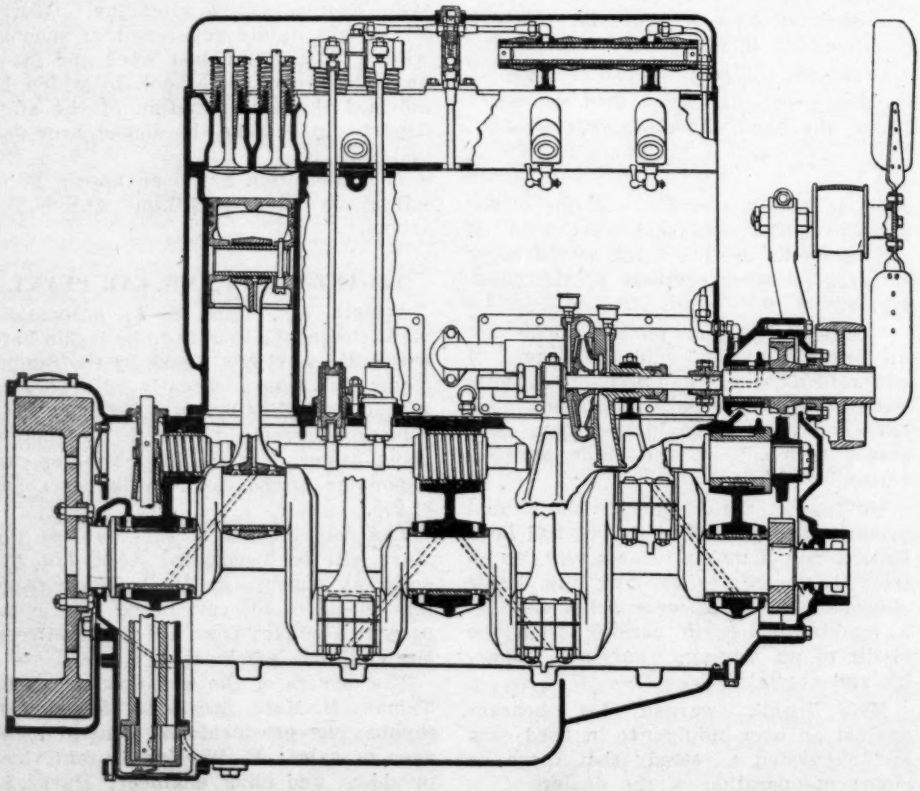
Cross section of the Stearns tractor engine. Note that the wrist pin is force lubricated by a lead that conducts the oil from the crank pin bearing

The piston is made of the same grade of grey iron as the cylinder. The top of the piston is well ribbed and the wrist pin bosses are well supported. Grooves are provided for three piston rings, the lower one acting as an oil ring.

Roller Type Valve Tappet

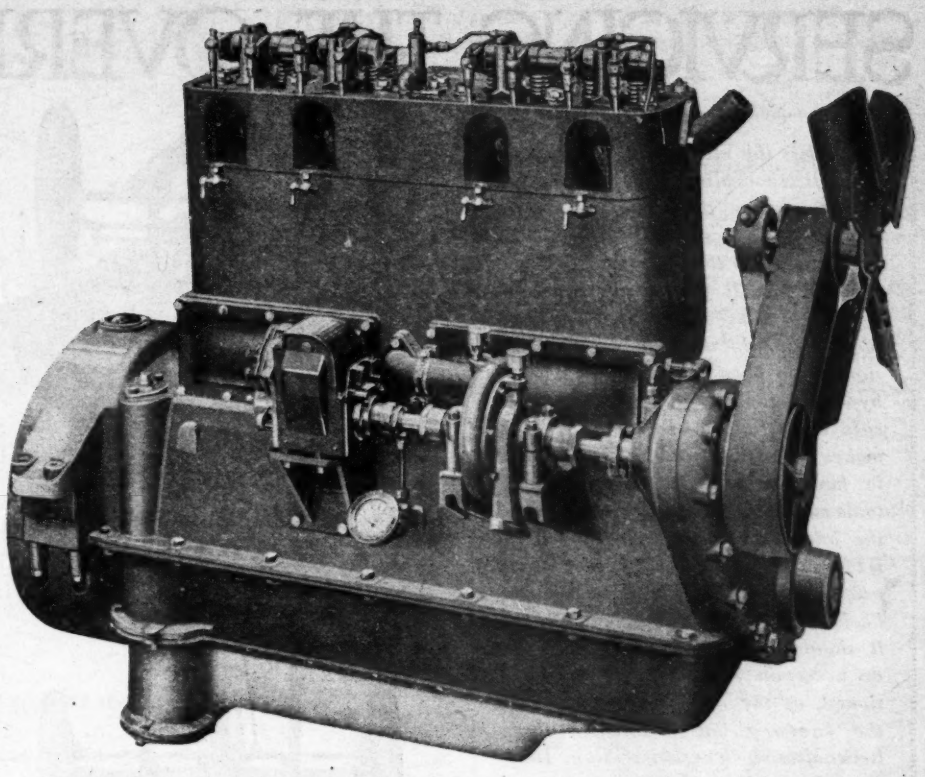
The valve tappet is of the well known roller type of an extremely sturdy and light design. The roller is made of 3½ per cent nickel-steel hardened and accurately ground to size. The roller pin is made of the same material, flats being milled on the end to insure this roller remaining in the correct relation to the cam. With this design the extreme side thrust on the roller is eliminated with a corresponding decrease in wear. The push rod cup is a hardened piece pressed into the valve tappet. The valve tappet bushings are hardened steel and pressed into valve tappet.

The oiling system is of the force feed and splash type, pressure being maintained when the engine is warm at 25 lb. by a large gear pump entirely submerged in oil. This pump and drive are one unit and can be removed by simply taking out four cap screws bolted direct to the crankcase and to our main oil header, which consists of a steel tube cast integral with the crankcase and eliminates all chance of leakage by do-



Side view of the Stearns engine. Full force feed lubrication is employed. Note the accessibility of the grease cups on the water pump drive

STEARNS SPECIFICATIONS
B. H. P. 41 at 800 R. P. M. 45 at 900 R. P. M.
Type .....Valve in head
Size.....Bore 4¾, Stroke 6½
Fuel.....Gasoline or kerosene
Cylinders.....4 Cast en bloc.
Front Main Bearing.....
.....2⅞ in. dia. by 3½ in. long
Center Main Bearing.....
.....2⅞ in. dia. by 4½ in. long
Rear Main Bearing.....
.....2⅞ in. dia. by 4½ in. long
Valve Dia.....2¼ in. clear opening
Carbureter size.....1½ in. S. A. E.
Type AU—With Bell Housing for Tractors of Unit Construction.
Type A—Open Flywheel Type—Without Bell Housing.



This shows the Stearns tractor engine with the pan over rocker arms removed.

ing away with all oil tubing. After the oil is forced through this lateral oil passage it is forced through a large drilled hole to each main bearing, from where it is forced through a hollow crankshaft to each connecting rod and through a copper tube to the wrist pin, which insures force feed lubrication under pressure at each and every bearing. Oil is also forced from this lateral passage through a copper pipe to a pressure relief valve located on the top of the cylinder head which can be adjusted to any required pressure by simply removing one plug on the cylinder head cover. This filler does not act as a breather and is air tight when closed to eliminate the possibility of dust being drawn into the engine. The breather is located at the very top of the engine. The breathing action is taken up through the push rod chamber through the cylinder head cover and therefore by the time it reaches the breather, the action is practically nil, but in addition to this fact the breather is provided with a diaphragm which will not allow any inward suction, but which will allow all pressure into the crankcase to be released.

The water pump is of the centrifugal type and of ample size to insure perfect cooling| It is rigidly supported by two brackets bolted to the crankcase and can be removed at any time by removing four hexagon nuts. The pump and the fan are driven by a large shaft of 1 to 1½ in. diameter with a bearing surface of 4½ in. On the outer end of this shaft the fan driving pulley is located.

The fan is a 22 in. steel stamping of the hub driven type running on a large Hyatt roller bearing and driven by a belt 2½ in. in width. Adjustment of this belt can be taken up by simply releasing one cap screw and turning an eccentric located in the fan bracket, which has sufficient eccentricity to allow for 1 in. fan belt adjustment.

The exhaust and inlet manifolds are cast integral and are of the hot spot type and of such a design as to insure good results and economy when burning low grade fuels.

Timing Gears.

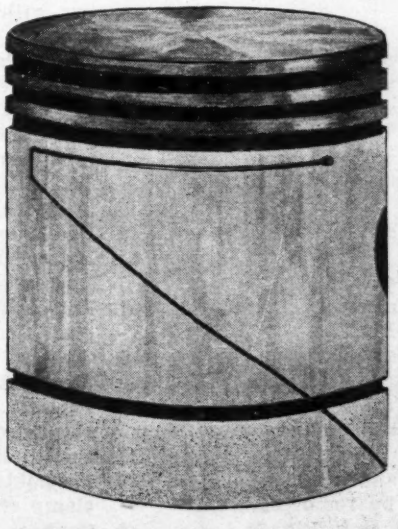
The timing gears are 1⅜ in. face and are of the spiral type. The crankshaft and the magneto drive gears are drop-forged steel. The camshaft gear is of high-grade semi-steel. This gear drive has been designed in such a way as to eliminate all idler gears, thereby eliminating the greatest source of gear trouble.

The engine is also designed so that it can be equipped with any standard governor and so arranged that there are no flexible shafts or curve drive.

New Kant-Skore Aluminum Alloy Piston Has Novel Expansion Feature

A NEW type of aluminum alloy piston invented by Mr. Al. Spillman, formerly of Herschell-Spillman Motor Co. of No. Tonawanda, N. Y., is now being placed on the market by the Sinclair Mfg. Co. of Buffalo. It will be known as the Kant-skore piston.

The distinctive feature of this piston is its provision for taking up the expansion caused by engine heat, without appreciably increasing the diameter of the piston itself. This is done by means of spiral grooves running through that part of the piston, which maintains approximate contact with the cylinder wall, together with a horizontal groove placed



directly under the ring grooves thereby decreasing the heat, generated in the head of the piston, traveling to the skirt.

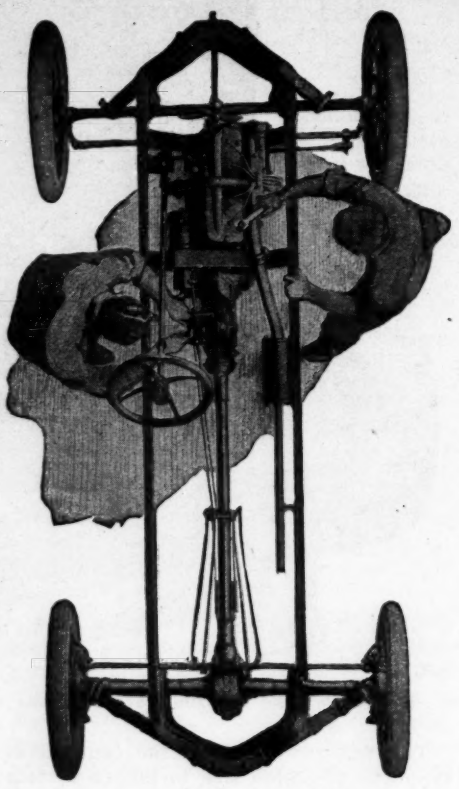
The advantage claimed is that this aluminum alloy piston can be fitted into the cylinder at one-half thousands clearance, which is less clearance than allowed for cast iron pistons, yet without "seizing" or scoring the cylinder. Likewise by avoiding large clearance which is usually deemed necessary to off-set the expansion of aluminum, under heat it is claimed that the Kant-skore piston, due to this small clearance, avoids all oil troubles, piston slaps, poor compression.

To these advantages, of course, are added all the standard claims in behalf of aluminum pistons, such as the reduction of dead-weight, decreased vibration, and ease of balancing the crankshaft.

The Kant-skore aluminum alloy piston is being offered not only to engine manufacturers, but also to dealers in repair shops for replacement purposes and particularly for use where cylinders are being re-ground and over-size pistons installed.

SERVICING THE OVERLAND FOUR

THIS is the eleventh of a series of articles dealing with the service operations on the Overland Four. The work as it stands has been prepared by the Willys-Overland Co. and the dealer will find at the head of each operation the amount of time required to do the job. The operations have been put down in a step-by-step method so that one operation is logically followed by the next. This makes it possible for the service man to have on hand all the necessary tools and equipment before beginning the job. Incidentally, the time limit set for the job affords a ready means whereby the skill of the mechanic can be judged. Other things being equal it should not take a man longer to do a certain job than herewith mentioned, as the service department of the factory has established these limits after much experimenting. Dealers who are not keeping copies of MOTOR AGE on file are suggested to do so to get the benefits of this series.



PART XI — The Engine

THESE valuable articles—Servicing the Overland Four—will run serially each week until the service operations on the entire car have been explained. This week deals with the

Engine

Next week will be a continuation of the service operations on the engine.

Keep a file of MOTOR AGE for ready reference. The flat-rate system of estimating on a job has been proved the best plan to make your service work more profitable, eliminate complaints and please your customers. The time given here for each service operation can be adapted to the flat-rate system of estimating cost of repair jobs on cars of this class.

TO REMOVE AND REPLACE TRANSMISSION SHAFT ANNULAR BEARING Time: 2 hrs., 30 min.

1. Take weight of car off rear springs, using chain falls or crane.
2. Remove cotterpin from rear axle spring bolt nuts.
3. Remove spring bolt nuts.
4. Drive out spring bolts.
5. Remove brake rod from brake pedal by removing cotter and clevis pin.
6. Disconnect hand brake rod from hand brake lever by removing wing adjusting nut.
7. With proper blocking, block up torsion tube and roll out rear system.
8. Unhook accelerator spring.
9. Unscrew accelerator button.
10. Remove clamping bolts holding clutch pedal pads to pedals.
11. Remove pedal pads.
12. Disconnect speedometer cable at speedometer head.
13. Remove floor boards.
14. Remove nuts and lock washers holding gearshift housing to transmission case.
15. Remove gearshift housing.
16. Disconnect speedometer cable at speedometer drive shaft end.
17. Remove four cap screws holding universal ball joint retainer to universal joint housing.
18. Remove universal ball joint and retainer.
19. Remove locking wire from four cap screws holding universal joint rings together, as in Fig. 22.
20. Remove four universal joint ring cap screws.
21. Remove universal joint rear yoke and ring.
22. Remove cotterpin from transmission main shaft nut.
23. Place transmission gear in low speed and remove transmission shaft nut.
24. Remove universal joint front yoke and ring.
25. Remove speedometer gear and shaft by removing nut at the top right side of universal joint, as in Fig. 24.
26. Remove speedometer worm.
27. Remove the three universal joint housing cap screws.
28. Remove one stud nut and lock washer and remove universal joint housing.
29. With a soft drift-punch, tapping lightly with hammer, drive out transmission shaft annular or rear bearing, as in Fig. 23.
30. Replace new bearing.
31. Replace universal joint housing with three cap screws and one lock washer and nut.
32. Replace speedometer worm.
33. Put in speedometer gear and shaft.
34. Assemble universal joint front ring and yoke on transmission shaft.
35. Place transmission gear in low speed and replace transmission shaft nut. Tighten securely and cotterpin.
36. Assemble universal rear yoke and ring with four cap screws. Tighten securely and lock with wire .
37. Assemble universal ball joint and retainer to housing with four cap screws, with lock washers under head.
38. Place transmission gears in neutral.
39. Place gearshift lever in neutral.
40. Put on gearshift box with four lock washers and nuts.
41. Roll rear system under car—one man steering torsion tube into universal joint. It may be necessary to hand crank the engine so that drive shaft can be assembled in universal joint.
42. Put in left rear spring bolt.
43. Lower frame in body so that right rear spring bolt can be assembled.
44. Put on spring bolt nuts. Tighten securely and cotterpin. Remove chain falls or crane.
45. Connect brake rod to hand brake lever with wing adjusting nut.
46. Connect foot brake rod to foot brake pedal with clevis and cotterpin.
47. Put in floor boards.
48. Assemble pedal pads to clutch and brake pedal with clamp screws, lock washers and nuts.
49. Connect speedometer cable to speedometer drive shaft at universal joint and speedometer head.

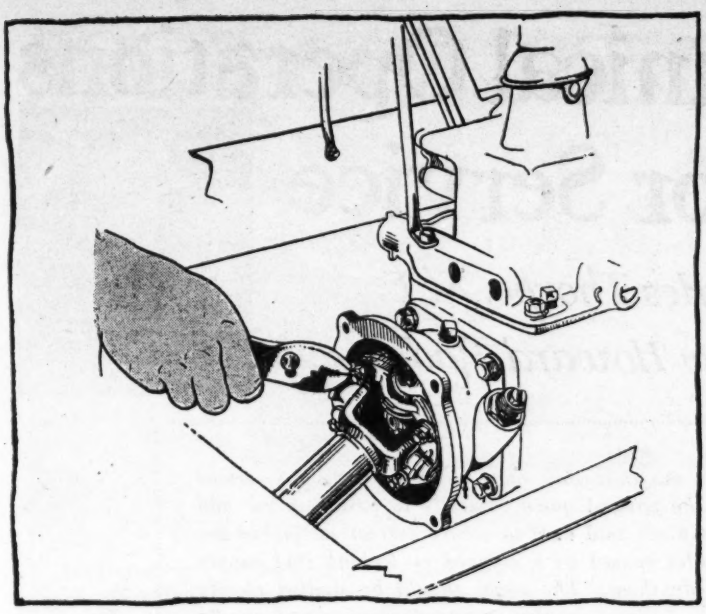


Fig. 22—Removing universal joint locking wire

50. Hook up accelerator spring.
51. Screw on accelerator button .

TO REMOVE AND REPLACE TRANSMISSION SLIDING GEARS ON MAIN SHAFT Time: 1 hr., 30 min.

1. Take weight of car off springs, using chain falls or crane.
2. Remove cotterpins from axle spring bolt nuts.
3. Remove spring bolt nuts from spring bolts.
4. Drive out spring bolts.
5. Remove brake rod from brake pedal by removing cotter and clevis pin.
6. Disconnect hand brake rod from hand brake lever by removing wing nut.
7. Disconnect speedometer cable at speedometer driving shaft.
8. With proper blocking, block up torsion tube and roll out rear system.
9. Remove four $\frac{5}{16}$-in. cap screws and lock washers from universal ball joint retainer and remove retainer and ball joint.
10. Remove locking wire from universal joint ring cap screws, as in Fig. 22.
11. Remove four universal joint ring cap screws.
12. Remove universal joint rear yoke and ring.
13. Remove cotterpin from transmission shaft nut.
14. Place transmission in low speed gear and remove transmission shaft nut.

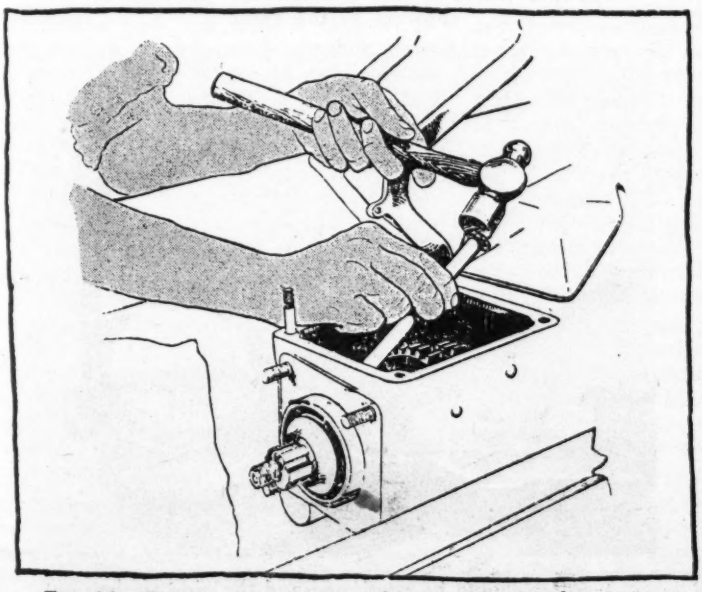


Fig. 23—Driving out rear annular transmission bearing

15. Remove universal joint front yoke and ring.
16. Remove speedometer driven gear and shaft by unscrewing nut at the top right hand side of the universal joint housing.
17. Remove speedometer driving worm. See Fig. 24.
18. Remove four nuts and lock washers from universal housing stud.
19. Remove four $\frac{5}{16}$-in. nuts and lock washers from gearshift box studs.
20. Remove four $\frac{1}{4}$-in. cap screws with lock washers from transmission case cover and remove transmission case cover.
21. Drive out rear transmission bearing, using soft drift-punch, as in Fig. 23. This bearing has a sliding fit and can be removed without damage if care is exercised by tapping drift lightly with hammer.
22. Pull out transmission shaft and remove one or both sliding gears.
23. Put in transmission main shaft, assembling sliding gears on shaft.
24. Replace transmission rear bearing.
25. Replace universal joint housing with lock washers and four nuts. Tighten securely.

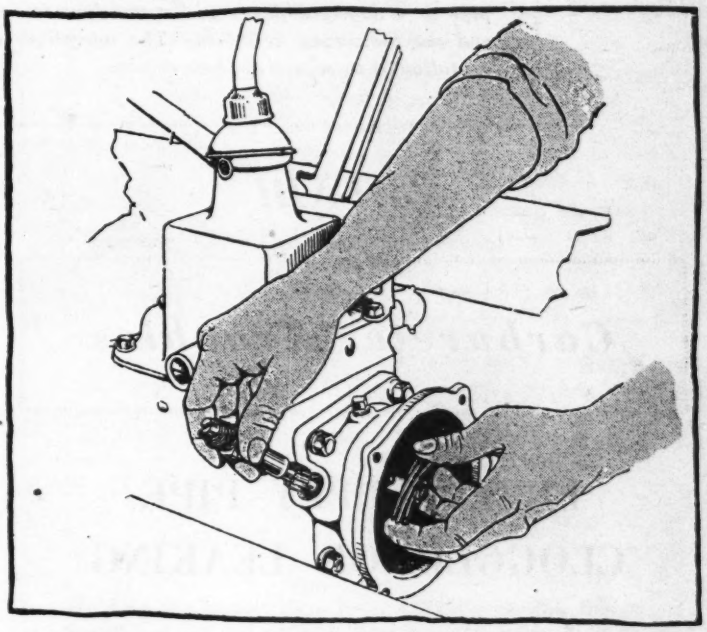


Fig. 24—Removing speedometer drive shaft gear and worm

26. Replace speedometer driving worm and install speedometer driven gear and shaft.
27. Replace front universal joint yoke with ring.
28. Put transmission in low gear and replace transmission shaft nut. Tighten securely and cotterpin.
29. Replace universal joint yoke, rear, with ring.
30. Replace four universal joints ring cap screws.
31. Lock with lock wires through holes in cap screw heads.
32. Replace universal ball joint and retainer, bolting retainer to housing with four $\frac{5}{16}$-in. cap screws.
33. Place transmission gears in neutral.
34. Place gearshift lever in neutral .
35. Fasten gearshift housing to transmission with four lock washers and nuts .
36. Replace transmission case cover with four $\frac{1}{4}$-in. nuts and lock washers.
37. Roll rear system under car—one man guiding propeller shaft into universal joint. It may be necessary to place transmission in low gear, hand-cranking the engine so that the splined end of the propeller shaft will slip into universal joint housing.
38. Put in left rear spring bolt.
39. Lower frame so that right rear spring bolt can be incorporated.
40. Put on spring bolt nuts and cotterpin.
41. Place hand brake rod in hand brake lever.
42. Connect brake rod to service brake pedal with clevis.
43. Remove chain falls or crane.

Standard Mechanical Operations in Tractor Service

by John Charles Thorpe, M.E.
and Gustav Howard Radebaugh

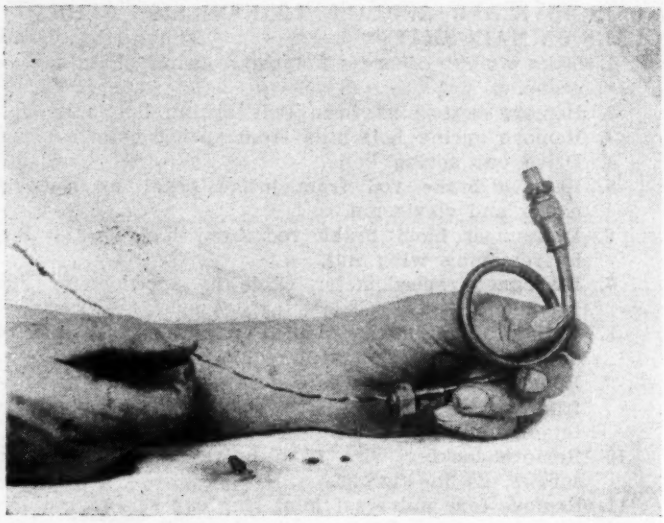
EDITOR'S NOTE: The two pages herewith are the thirteenth of a series covering the service operations on tractors, although the same can be applied quite generally to passenger car and truck engines. In last week's issue of MOTOR AGE we told how to secure correct seating of the float valve. This installment deals with the troubles caused by a clogged or leaking fuel supply pipe or a damaged flange gasket and how to remedy them. The views should be studied closely and the tools used as shown. The operations are depicted in the approved manner and should be followed to secure the best results.

Part XIII

Carbureter Troubles

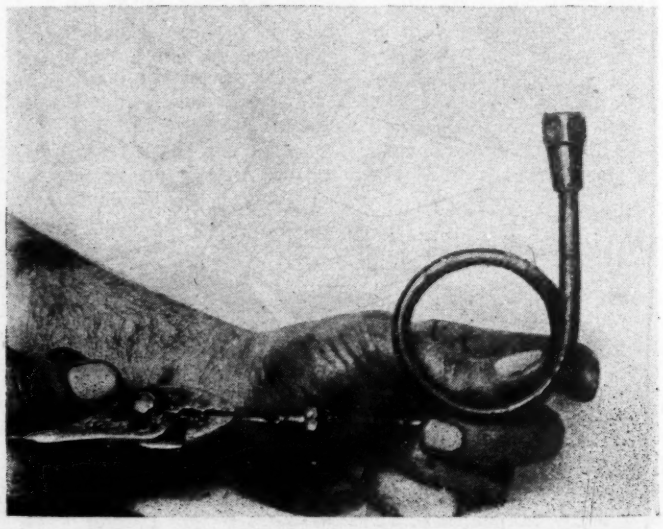
FUEL SUPPLY PIPE CLOGGED OR LEAKING

An obstructed or leaky fuel supply pipe often introduces trouble with proper carbureter operations and makes all operations of carbureter repair and adjustment useless. To make repairs on this pipe, the carbureter should be drained after closing the fuel tank valve, and the pipe removed from the engine.

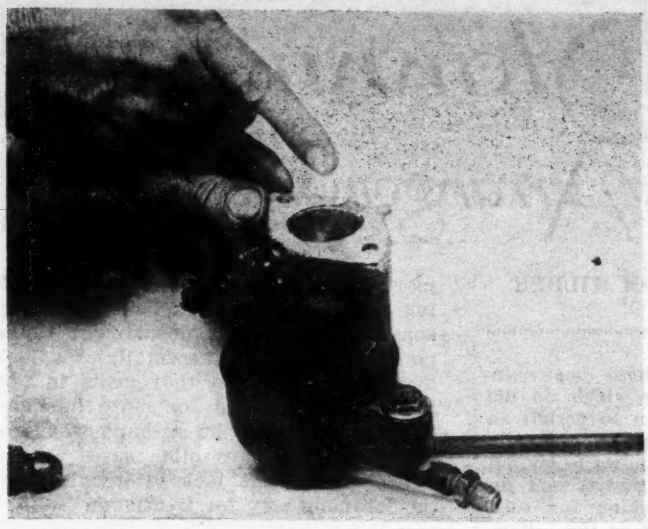


2—With a firm grip on the wire with pliers, the wire should be pulled back and forth through the pipe. This view shows wire pulled through from the end opposite where it was inserted and particles of dirt showing as the result

1—Insert flexible wire in supply pipe, allowing a considerable length to protrude at each end



3—This should be continued and the pipe washed out thoroughly with kerosene before re-assembly

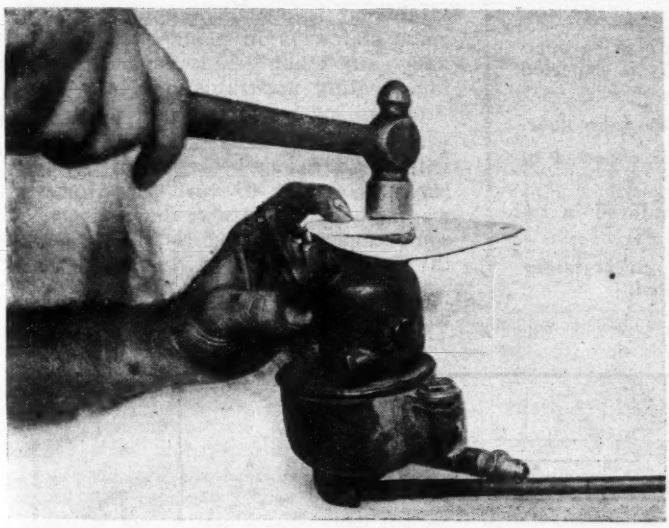


1—Disconnect carbureter from manifold stand pipe by removing flange bolts or machine screws. Note broken gasket

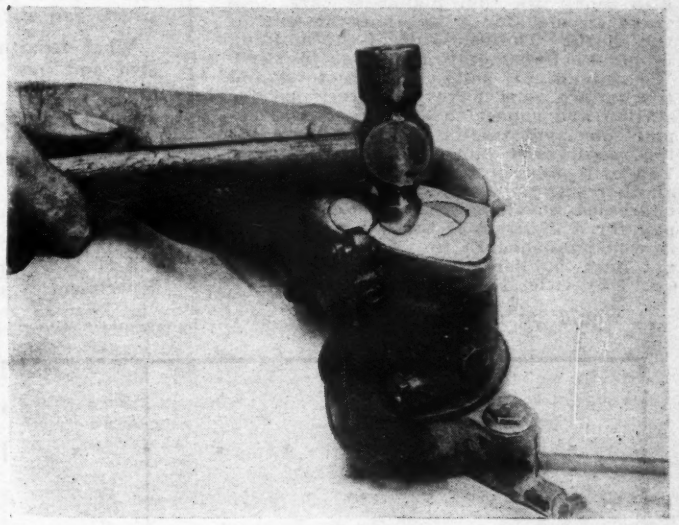
Carbureter Troubles

CRACKED OR DAMAGED CARBURETER FLANGE GASKET

"Coughing" or "spitting of the engine indicates a too "lean" mixture, or a proportion of air too great for proper engine operation. This sometimes results from a cracked or damaged carbureter flange gasket that allows air to leak into the gas intake manifold. It is seen that this would make perfect carbureter action useless.



2—Cut a piece of asbestos paper about the shape of the flange. Cut to size by laying it over the flange and cutting out with hammer



Holding the gasket thus formed firmly on the flange —cut out the gas opening and the bolt holes as indicated, using the ball peen surface of the hammer.

The Pneumatic Truck Tire

(*Continued from page* 15)

the engine and rear axle is favored as this divides the propeller shaft and reduces its length which is desirable in trucks with long wheelbases. There are some gearsets to-day affording five forward speeds. This is done by having a double drive to the countershaft as used by Fageol.

As to which of these schools will win out, the future alone can tell. Naturally the single gearbox design is favored by the majority of people. It is traditional to have a single gearbox. The exponents of two gearboxes urge their claim that the two are very light as well as cheap to produce. Both agree on the one fundamental, that a greater number of forward speeds are needed with a Giant pneumatic truck.

Gearset manufacturers agree in that the pneumatic tired truck is a great step in advance. A year ago some of them considered the pneumatic tired truck too radical and did not take it seriously. To-day they have changed their minds. They recognize that it is going to literally revolutionize the truck field. The pneumatic tire makes it possible for the truck to invade new fields of activity. The higher daily mileage points to a revamping of our conception of transportation. The reduction in vibration has untold possibilities within its grasp. The gearset maker is aware of these to-day and while he has been slow getting in the field he is on development work.

In the meantime the transition from solids to pneumatics is going ahead. There are thousands of truck owners who are making the conversion, not because of higher speeds, but solely to reduce maintenance costs and to increase the slow average of the solid tired job.

Designers of engines are in a very unsettled condition as to what must be done. Some of them take the view that the crankshaft r.p.m. must be increased from perhaps 1200 r.p.m. to 1500, perhaps 1800 or higher. This points to pressure lubrication, to the main crankshaft bearings, to the lower connecting rod bearings and to some other engine parts. The higher crankshaft speed points to a reduction in the weight of pistons and connecting rods. It points to a possible general alteration in engine design to give higher speeds with great reliability.

In the meantime trucks to the extent of 135,000 will be delivered by the manufacturer fitted with pneumatic tires this year. Most of these will have the same engines as were formerly used for solid tires. There are instances such as the new Packard, which has been readapted to the pneumatic tire by using a 5-ton engine in a 3-ton chassis. The new Graham truck has been designed with the thought of the pneumatic tire in mind. There are literally a score of other truck makers working on their pneumatic tire jobs.

Some of the truck makers are increasing their crankshaft speed 10 per cent. The engine design will withstand this.

(*Continued on page* 60)

Garage Planning
Service Station Arrangements

No. 216

SIX STORY GARAGE IN OLD BUILDING

CONDUCTED BY TOM WILDER

We would like for your Garage Planning Department to plan a garage for us in a building of the following dimensions: building is 60 ft. by 145 ft. six stories and basement. We do not want to use basement. Our idea is to have an office and small showroom combined. Also women's restroom.

Would like a small parcel checkroom and private office. Stockroom should be large enough for tires, accessories, etc., also repair for four makes of cars. We want an elevator 8 by 18 ft. in one of the shafts. The east side of the building is plenty light, only the west is blind. We intend to sell cars, tractors and trucks, we now have a battery service station and expect to have a general repair room, vulcanizing department, radiator repair, and joint re-top department. You will find our building diagram on another sheet. Am inclosing a stamped addressed envelope, would be willing to pay for a diagram if could get it before it was published in the Motor Age. If not just publish it.—River-View Motor Co., Maysville, Ky.

It would be a great deal easier and more to the point, especially when dealing with an old building like this if persons consulting this department would go a little more into detail. We look over inquiries when they come in and in many cases send for more information so that it will be on hand when we need it, but in many other cases we are not aware of the lack of details until the job comes up for treatment.

If you had given us the measurements locating the light shafts and distance apart of the windows on the alley side of your building we could make a more intelligent layout. There must also be some stairways in a six-story building and many other details such as plumbing, heating apparatus, etc.

We do not doubt but that our layout which costs us considerable to prepare will be all wrong because you have not given us enough to work on. However, we might add that we have expended some conscientious effort and hope that the result is what you want.

It would be reasonable to suppose that with six floors at your disposal you

MOTOR AGE is receiving many inquiries for garage plans which do not give sufficient information to permit an intelligent reply. There are certain things which should be known to lay out the proper plan for a garage, and inquiries are urged in asking for such plans to be used to include the following information:

Rough pencil sketch showing size and shape of plot and its relation to streets and alleys.

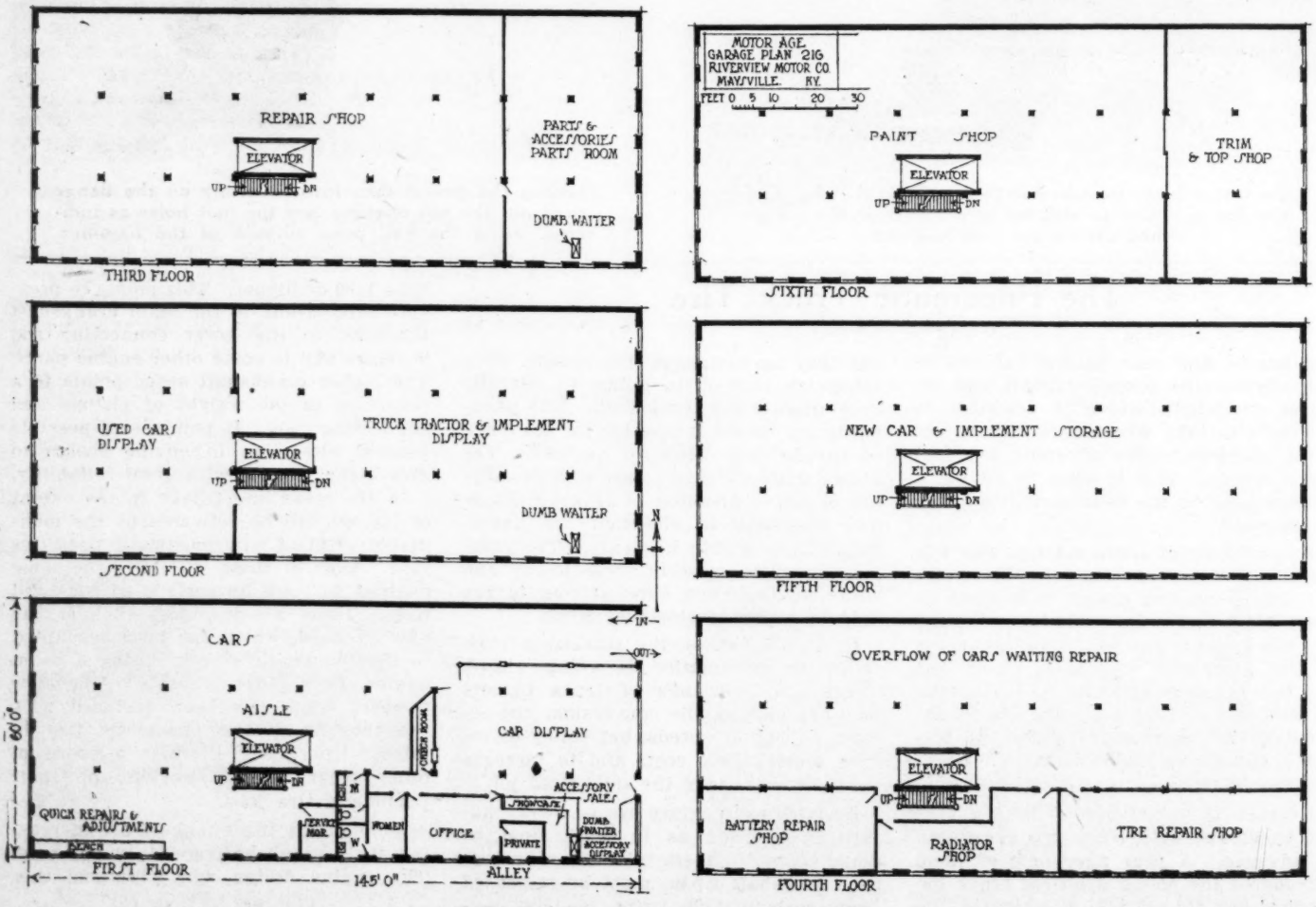
What departments are to be operated and how large it is expected they will be.

Number of cars on the sales floor.

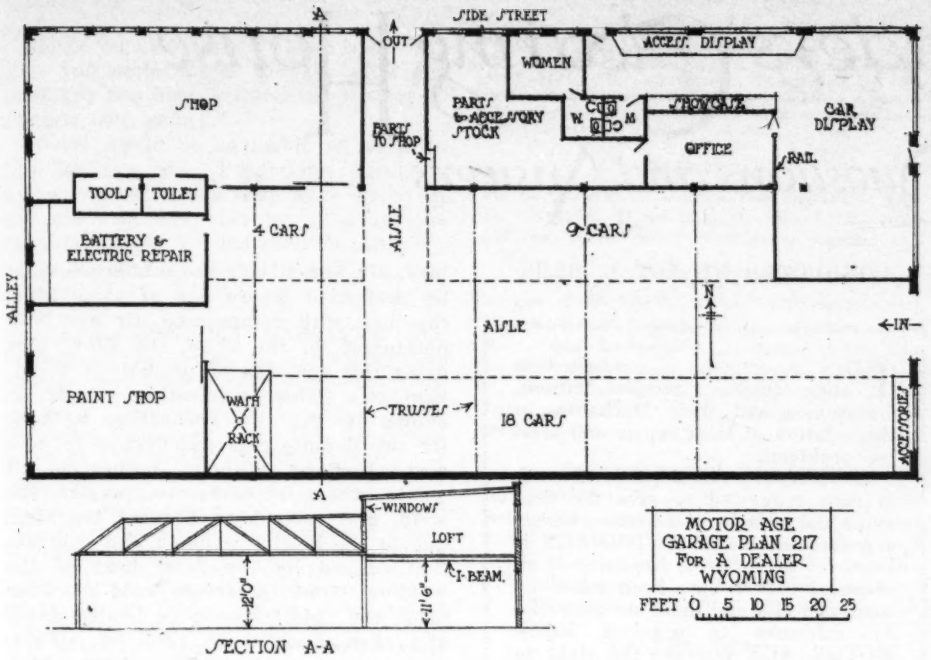
Number of cars it is expected to garage.

Number of men employed in repair shop.

And how much of an accessory department is anticipated.



No. 216—Six story garage in old building



No. 217—Roof trussed over garage section of building

would need a good part of your ground floor for display purposes; especially if you handle four makes of cars and tractors and trucks beside, and do any considerable business. We cannot agree to putting the battery service room, probably the most messy of all the departments, on the main corner of your building and the most valuable for display purposes.

If you want a place to receive and deliver batteries build a stall and counter in the rear somewhere and receive and deliver tires and radiators and in fact any repair jobs of this kind that can be left. Then one clerk can take care of the whole lot of details and keep things in order.

The floors have been used in relation to the amount of traffic between them and the ground as much as possible. The paint and trim shops take the top floor because the cars stay a long time and the demands on the elevator are very light; also there is good light and very little dust, two prime requisites.

The fifth floor is for storage of new cars and implements, etc., also requiring little elevator service.

The fourth floor is used for storing cars waiting their turn in the shop either on the third floor or the special shops of the fourth floor.

All stock is on the third floor and the room is in direct communication with the accessory sales department on the main floor through a dumb-waiter. The stock is also handy to the repair shop.

Second floor space is devoted entirely to sales, the used cars having the rear and other lines except cars having the front.

If we have made a mistake in guessing as to which is the front of the building, your diagram not showing this, you can reverse this plan by tracing it through on the back.

No. 217

ROOF TRUSSED OVER GARAGE SECTION

We are contemplating building a modern garage 75 by 150 ft. and would appreciate plan or suggestions that you can offer.

The 75 ft. front faces the main street on the east and the 150 ft. side faces a side street on the north, this side street being used very little. The building on the west joining the alley.

The main entrance ought to be on the 75 ft. east front, and other entrances could be either on the north to that street or on the west to the alley. Or both places if necessary.

We would want a car display room, ladies' rest room, with toilet, office, men's toilet, accessory and stock room, battery and electric service room, good well equipped repair room, paint room and shopmen's toilet. Also place for the storage of between 20 and 30 cars if there is room. Perhaps it would be a good plan to have a room adjoining the repair shop for repair parts and tools. A washrack perhaps could be had in one corner of the car storage space.

Windows can be made on the west, north and east, and any room on the south side could be lighted by skylights.

The battery and electric service would be a prominent part of the business and should be located handy to give prompt service. The paint room could be located in the back and if not used for painting, used to store new machines.

Would prefer an arrangement so that the man in the office could attend to the accessory sales as well and perhaps the repair stocks, too.

What kind of a roof would be the best for this size building, and of what material should it be made?

What would the approximate cost of this building be if made of cement blocks or tile with stucco facing?

Thanking you in advance for this plan, —Dealer, Wyoming.

Perhaps you will not approve of our location of the accessories so far around on the side street, but the 75 ft. width of your lot lends itself so nicely to this arrangement and there is so much light for your office, etc., on that side that we think it is really the best scheme. A well kept up and frequently changed display in the window at the south end of the front will go a long way towards bringing accessories to the notice of passers-by on the main street. If they see what they want or really want it whether they see it or not, they will come in and find it.

A roof arrangement such as we show would be very good; trussed over the garage part and with I beams or timbers across the shop and office section. You might take advantage of the saving in space above the shop and office by putting in a second story. It would be an ideal place for stock room and more especially battery and paint shops if later you find you need more room.

Skylights will be needed in the garage, but it would be optional whether they would be used elsewhere. We would suggest having small ones in the back part of the shop if the second floor scheme is not used.

We would make a guess, based on the cost of buildings we have known about, that this building would cost anywhere from $52,000 to $60,000. This is not an estimate, however, only a rough calculation.

Acason Brings Out New Series of Assembled Trucks

THE Acason Motor Truck Co., Detroit, has brought out a new series of assembled models of 1, 1½, 2½, 3½ and 5-ton capacities. In connection with a number of changes in the make of component parts, a new price list goes with the new line of trucks. These trucks incude the new Waukesha engine, with Waukesha governor, Timken axles, Eisemann magento with impulse starter and Marvel carbureter.

The gearset is a Cotta mounted amidship and the propeller shaft and universal are the product of Blood Bros. The steering gear is Ross and lubrication is by the Alemite system.

The 5-ton model has an engine rated at 60 hp., 5 in. bore and 6¼ in. stroke. It is governed for a road speed of 14 miles per hr., and has a low gear reduction of 55 to 1, standard, and 60 to 1, optional. The wheelbase on the standard chassis is 187 in., and on the dump chassis 172 in. Tire equipment is solid on Smith steel wheels 30 by 6, front, and 40 by 6, Dual, or 40 by 12 Giant, on the rear. The list price is $5850.

The 3½-ton model is rated at 50 hp., with a 4½ by 6¼ in. engine. The wheelbase is the same as the 5-ton, the list price being $4900.

The 2½-ton, rated at 42 hp., with a 4⅜ by 5¾ in. engine, has a governed road speed of 16 miles per hr., which is the same as the 3½-ton model. The wheelbase is 150 in., standard, and 166 in., special. The tire equipment is solid, 36 by 4, front, and 36 by 8, rear, single, or 4 in. Duals. List price is $3850.

The 1½-ton is rated at 38 hp., with a 3¾ by 5¼ in. engine, four-speed gearset and governed for a road speed of 18 miles per hr. The list price of this model is $2650.

The Readers' Clearing House

Questions and Answers

WELDING

Q—What is the most efficient method of repairing scored cylinders?

2—Could cylinders be repaired without pre-heating, that is, welded by metallic arc process and ground?

3—What is the Lawrence Eagle process and how is it used? Would cylinders have to be rebored?

4—Advise best method of repairing a broken aluminum crankcase? Could it be welded by metallic arc; if so, state volts and amperes.

5—Could tobin bronze be welded to cast iron by same process?

6—I desire to build a permanent natural gas furnace or oven to preheat parts for welding. What is the proper temperature for aluminum and cast iron and what kind of burners are best suited for this work?

7—Where could instruments for determining oven temperature be purchased?

8—Where could I buy a gas burning outfit, suitable for welding on aluminum and light preheating?

9—I use Presto acetylene gas in a 300 cu. ft. cylinder. There is considerable waste when the pressure is down to 60 lb. and am forced to ship same on Could this gas with safety be taken from the tank and placed in another, say pumped to a pressure of 160 lb. and what kind of pump would be suitable?

10—Where could I obtain books on electric and oxy-acetylene welding?—H. L. Collins, Hot Springs, Ark.

CONDUCTED BY ROY E. BERG
Technical Editor, Motor Age

THIS Department is conducted to assist Dealers, Service Stations, Garagemen and their Mechanics in the solution of their repair and service problems.

In addressing this department readers are requested to give the firm name and address. Also state whether a permanent file of MOTOR AGE is kept, for many times inquiries of an identical nature have been asked by some one else and these are answered by reference to previous issues. MOTOR AGE reserves the right to answer the query by personal letter or through these columns.

Welding

1—There are several very efficient processes for repairing scored cylinders, but we cannot say which one is most efficient.

2-3—Cylinders can be repaired without preheating. The Lawrence process is an electric welding repair in which they use an alloy of silver and nickel which is melted into the scored section of the cylinder. This process does not require reboring of the cylinder, but merely regrinding it, and the company claims that the repair can be made for about one-tenth the cost of reboring. Another patented process in which no preheating is required is the Trindl copper alloy process. This is purely a mechanical process in which no heat is used at all, and it is claimed that the cylinder can be repaired without regrinding.

4—The question as to which is the best method for repairing aluminum crankcases is largely a matter of opinion, as both oxy-acetylene and electric process have proven quite satisfactory. In either case the crankcase must be preheated where gas of some kind, together with compressed air are both obtainable in the shop, the blow pipe using this fuel can be used to great advantage. This preheating torch is shown in Fig. 1. Preheating is done for two definite reasons; first, it reduces cost, because without preheating it would take a lot of gas to complete the weld, and second, to prevent cracking, due to the local expansion and contraction caused by the local heat of the welding flame. After the weld has been made the object should be heated again and then allowed to cool off slowly. Aluminum must be preheated to a high temperature on account of the fact that within 50 deg. C. of the melting point metal is very brittle and without strength. It is customary to heat up aluminum crankcases thoroughly until they will melt half and half solder in wire form. When aluminum is heated an oxide film is formed which prevents the metal running together and forming a suitable weld, to overcome this the aluminum filling rods must be inserted into the molten aluminum, which is being welded and moved rapidly similar to puddling in order to break up the oxide film and allow the aluminum to run together. A larger tip is necessary for welding a section of aluminum than would be required for the same section of steel or cast iron. This is due to the fact that aluminum inducts heat away very rapidly. There is a very good flux on the market and is very desirable in making an aluminum weld. All precautions should be taken to have the work securely fastened or harnessed for welding a hole in the side of a crankcase, for instance.

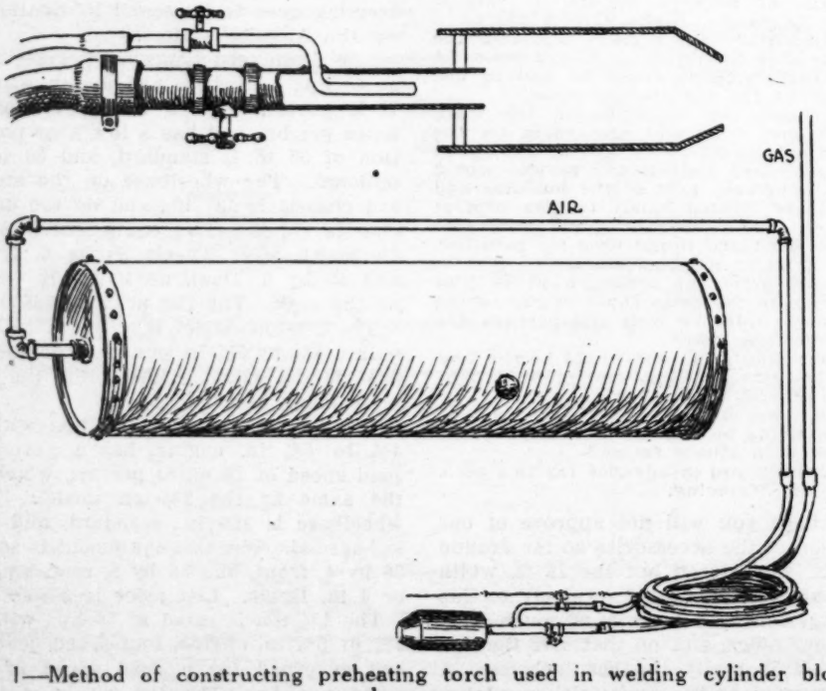


Fig. 1—Method of constructing preheating torch used in welding cylinder blocks, crank cases, etc.

5—Tobin bronze can be welded to cast iron by the same process.

6—Cast iron should be preheated to a temperature of about 1000 deg. F., or about a dull red heat. Aluminum should be preheated to about 560 deg. F. Any combination burner by which you can mix the air and gas together and regulate it will be suitable for a furnace such as you desire to build.

7—You can purchase a pyrometer from the following companies: Leeds & Northrup Co., 4921 Stenton ave., Philadelphia, Pa.; Taylor Instrument Co., Rochester, N. Y.; American Steam Gage and Valve Mfg. Co., 208-20 Camden st., Boston, Mass.

8—You can purchase a gas burning outfit suitable for welding on aluminum and light preheating from the following companies: Oxweld Acetylene Co., 36th st. & Jasper pl., Chicago; Imperial Brass Mfg. Co., 1234 W. Harrison st., Chicago; Prest-O-Lite Co., 30 E. 42d st., New York.

9—As far as we know there is no way that you can remove the gas after the pressure has been reduced as low as 60 pounds with safety.

10—It would be advisable to write to the McGraw Hill Publishing Company and see what books they have on welding methods and also to write various manufacturers for instructions and descriptive matter on their welding machinery.

CLEANING OUT RADIATOR

Q—Is the Northway Six engine, as used on the Oakland and Oldsmobile cars, capable of rapid acceleration and hill-climbing ability on high, if carbureter is properly adjusted? Is this a high-powered engine for weight of car?

2—What causes flooding when choke is used in a Johnson carbureter of the automatic airplane type?

3—How can a radiator be cleaned which fills part way, then overflows, and then fills up O. K.? The radiator does not overheat, but it has had some anti-freeze in it of a thick, brown kind called "natural never freeze." Can is be used as it is after cleaning?—H. Temple Deamon, Marble Cliff, O.

1—With everything in good working order this engine should give good acceleration. The hill climbing ability is dependent to a great extent on the gear ratio used.

2—When the choke is closed the air ports for the primary air passing to the strangle tube are closed. The velocity of the air is so low the sleeve will not raise to admit auxiliary air resulting in a very rich mixture. You can see that if the choke remains closed that there will be so much gasoline in proportion to the air that is admitted that flooding will result.

3—The best thing to do is to fill the radiator with a hot solution of soda, about 30 per cent, and allow it to remain about 2 hrs. Drain it off and flush the system thoroughly with clean water.

SOLDERING RADIATOR TUBES

Q—Explain the essentials of soldering.

2—How are the center tubes of radiator repaired at the bottom?

3—Is sal-ammoniac used to tin soldering iron and how is the solution made?—Clifton B. Norris, Willow Shade, Ky.

1—The first essential of soldering is absolutely clean surfaces of the parts to be soldered. This means not only wiping them off with gasoline, but removing the oxides as well. The best method is to scrape or file the surfaces. Both parts should be properly heated and the soldering iron must be hot in order to have the solder run. The iron should never be red hot. A soldering flux is used to make solder stick well, and if the two surfaces of the metals are copper, for instance, they should be tinned before putting them together. The joint to be made should be kept in a horizontal position, so that the solder will not run off of the work. When only a small amount of solder is to be used a process known as sweating is used. The two pieces of the joint are placed together and heat applied either with a blow torch or a large soldering iron that will conduct heat to the work. Sal-Ammoniac is used to help tin the soldering iron and is a crystalline compound that can be purchased at any drug store. As the solder has very little tensile strength the longer the lap of the joint the stronger it will be.

2—The process that is generally used in repairing tubular radiators is to remove the shell, unsolder the top and bottom tanks and slip a tube inside the damaged part. The first step is to place the radiator face downward on a bench or stand and with a torch unsolder the lugs which hold the shell to the body, as shown in Fig. 2. Then heat the lower header flange and pry it up with a screwdriver or old file, bent as shown. A small flame should be used for this work, and it is essential that it should not be held too long at any one spot, as the parts should not be damaged unnecessarily. They must be soldered later on, so it pays to do the job well. The bottom of the tank should be removed first. When this is done both ends of the tubes will be exposed. The next step is to get the damaged tubes straightened. This can be done as shown in Fig. 2. A long steel rod bent for a handle is forced through the tubes. This operation, in addition to straightening the tubes, will clean out the inside. When the leaky tubes have been found, flare the top and bottom ends with a blunt-end chisel, or by placing a flat head wood screw in the tube and tapping it lightly with a hammer. Then push a new copper tube of the right diameter into the old one and solder to the latter at each end as shown in Fig. 3. As long as the ends are well soldered there will be no leaks in the radiator. When only a few of the tubes are damaged the method shown in Fig. 4 can be used. In this case it is necessary to force the fins apart and pinch the ends of the tube together, after which solder is applied. This method eliminates the use of the tube, but is all right when only one or two of the tubes are damaged.

3—See 1.

TO assist readers in obtaining as a unit all information on a certain subject, MOTOR AGE segregates inquiries in this department into divisions of allied nature. Questions pertaining to engines are answered under that head and so on.

WELDING

H. L. Collins.....Hot Springs, Ark.
H. Temple, Deamon.....Marble Cliff, Ohio
Clifton B. Norris.....Willow Shade, Ky.

MISCELLANEOUS

James O. Coffee.....Springfield, Ill.
River Road Garage.....Tiffin, Iowa
R. Leland Bealert.....Hughesville, Mo.
E. Hyman .....Chicago
R. W. Pennington.....Grangeville, Idaho
John Smith.....Kansas City, Mo.
Richard Kemp .....Chicago

THE ELECTRIC SYSTEM

Ray Filler.....Racine, Wis.
River Road Garage.....Tiffin, Iowa
John Williams.....Action, Ind.
Ben. Zimmerman.....Flatwillow, Mont.
F. T. Qualman.....Milwaukee, Wis.
J. J. Vorndran.....Ft. Wayne, Ind.

ENGINES

W. H. Mast.....Pomeroy, Wash.
R. A Cade.....New York
Wilber L. Jerman.....Silver Spring, Md.
Frank Sefrick.....Cuba, Kans.
R. A. Black.....DeKalb, Ill.
R. H. Rove, National Motor Sales Co.....
.....Chicago
C. R. Keller.....Toledo, Ohio
Raymond F. Mausert.....
.....Gloucester City, N. J.
Robert Larson.....Boelus, Nebr.
D. H. Keiser, Jr., Co.....Reading, Pa.
F. J. Norris.....Detroit

VACUUM TANK TROUBLE

Q—A 1917 Overland, 85-6, equipped with a Continental engine, has been giving considerable trouble, and notwithstanding the fact that new carbureter, vacuum tank, piston rings, coil on the ignition have been installed the difficulty still exists. Car runs perfectly when idling and will run from 4 to 50 mi. on high, but when car is on left side of road

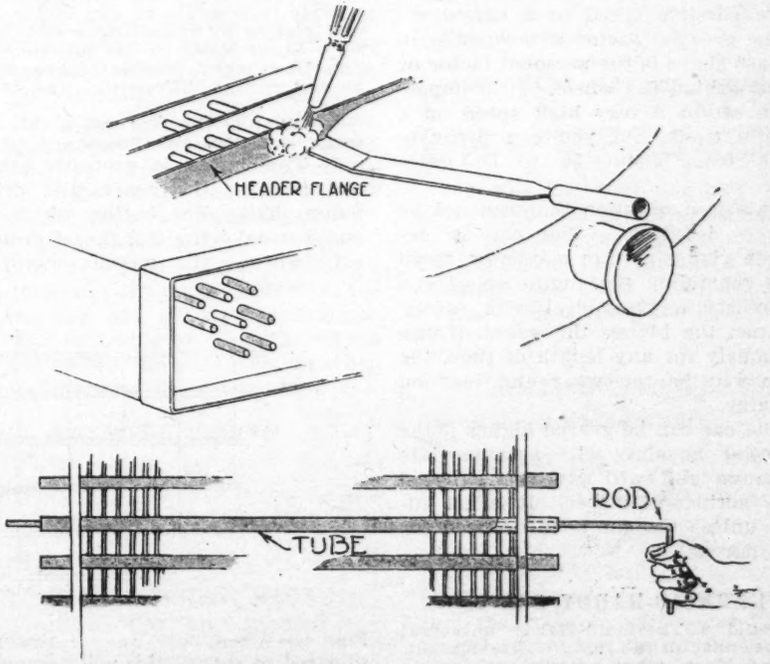


Fig. 2—Method for soldering radiators of the tubular type. Forcing a long thin rod through the tubes before soldering straightens as well as cleans them

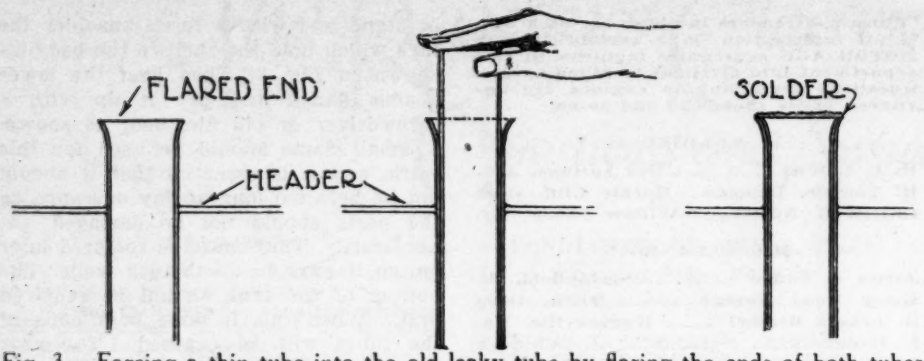


Fig. 3.—Forcing a thin tube into the old leaky tube by flaring the ends of both tubes and soldering them a perfectly tight join is made

and the right side is higher it loads up and misses and hardly runs. Compression is good, the ignition seems perfect, also the valve timing; a set of A. C. ⅞-in. spark plugs are used. What is the cause and remedy?—James O. Coffee, Springfield, Ill.

The trouble is in the vacuum system. When the car stands so the right side is higher than the left it may cause the float to get into a position that makes it leak, which will result in loading due to the fact that the suction pipe will draw raw gasoline directly from the vacuum tank into the manifold. The air vent may also become clogged, which will give the same trouble.

Miscellaneous

GETTING MORE SPEED

Q—I have a four-cylinder car, 5 by 5 1/16, equipped with 34x4 wood wheels and 34x4½ Royal cord tires; there are three speeds forward, and the racing type body is very much underslung. What should be the speed of this car on a ½-mile dirt track, and on a straight-away?

2—What should be the safest r.p.m. of the engine at very fast driving?

3—It is claimed the car is geared 3 to 1, but it has lots of power on big hills. Would it be advisable to gear it higher? It seems as though the faster the engine runs the cooler it is; why is this?—River Road Garage, Tiffin, Ia.

1—There are many factors that govern the possible speed of a car. Perhaps the greatest factor if the car is in first class shape is the personal factor or the man behind the wheel. It is impossible to attain a very high speed on a half mile track, but you can probably average from about 50 to 55 miles per hr.

2—This is a question that can not be answered definitely. The car is designed to give a certain maximum speed and by rebuilding the engine speed can be increased a great deal with safety. Of course, the higher the speed, if run continuously for any length of time, the greater will be the wear and tear on the engine.

3—The car can be geared higher if the differential housing will accommodate the change and will give more speed with a sacrifice of power. It is not advisable unless the car is to be used for racing purposes.

THERMOID-HARDY JOINTS

Q—Could a Thermoid-Hardy universal joint be put on a 1916 Willys-Knight, 88-4, and if so, what adjustments would have to be made?—R. Leland Bealert, Hughesville, Mo.

The chassis diagram of this car shows a fabric joint at the front end of the torque tube. The Thermoid-Hardy universal joint can be used in place of the present joint without any but minor adjustments.

USING ETHER

Q—Publish formula for mixing ether or other solutions with gasoline to make more power and yet will not injure the engine. Want to get more power out of some trucks.—R. Ward, Las Vegas, Nev.

We do not advise the use of ether in any mixture whatever. If you use ether it is true that it will pep up your engine, but without any question it will in time undo all that the designers of the trucks have endeavored to do. In designing these trucks the engineers have taken the fuel situation into consideration and have built the truck accordingly. The use of picric acid or ether to liven up an engine will only shorten its life and cause trouble. However, where ether is used the proportion is one ounce to one gallon of gasoline.

PUMP SHAFT KNOCK

Q—There is an annoying tap in a 1917 Studebaker 6 when running about 20 m.p.h. The valves have been taken up with no avail. When a finger is held against the water pump shaft the noise disappears. What is the cause?

2—Is it possible to get better mileage and pickup by installing a new carbureter? Eight m.p.g. is the present mileage.

3—How many pounds of grease should be put in the differential and transmission?

4—What is the best speed this car can make?—E. Hyman, Chicago.

1—This knock is probably caused by end play in the gears that drive the pump shaft. The button which is supposed to take the end thrust is undoubtedly worn. The trouble ought to be remedied immediately or it may result in damage to the rest of the gears in the train.

2—A great many carbureter improvements have been made since 1917 to meet the present-day fuel conditions and it is probabe that a new carbureter will give better results.

3—We have not taken the trouble to determine just how many pounds of grease should be put in the differential and transmission, but you can find out very easily yourself. Clean out the assembly and fill it to the proper level with kerosene. Drain off, measure carefully, and you can figure about 8 lb. of grease to the gallon of kerosene. However, the information can be obtained from the Studebaker company.

4—This car will make about 55 m.p.h. under average conditions.

ELECTRICAL EQUIPMENT BOOK

Q—Some time ago you were running articles in Motor Age, taken from a book published by the U.P.C. Book Co. What is the name of the book, what does it cost, and where may I obtain a copy?—R. W. Pennington, Grangeville, Idaho.

The book you refer to is The Electrical Equipment of the Motor Car, by Moreton and Hatch, published py the U. P. C. Book Company, New York. It is $2.50.

1913 RAMBLER

Q—What is the bore and stroke of the 1913 Rambler?

2—What is its rated horsepower?

3—What is the gear ratio?

4—About what speed will it attain?—John Smith, Kansas City, Mo.

1—The bore and stroke of this engine is 4½ by 5 in.

2—The N. A. C. C. horsepower rating is 32.40.

3—This car had a rear axle ratio of 3.71 to 1.

4—It will attain a speed of about 45 m.p.h.

DROP FORGINGS

Q—Publish names and addresses of companies that manufacture drop forgings such as crankshafts and connecting rods? Are there such companies in Chicago?—Richard Kemp, Chicago.

Union Drop Forge Co., 358 West Grand ave.; J. H. Williams & Co., 36 South Clinton st.; Standard Forging Co., Railway Exchange bldg.; Sterling Drop Forge Works, 112 North La Salle st.; John Obenberger Drop Forge Co., Milwaukee, Wis.; Indiana Drop Forge Co., Indianapolis, Ind.

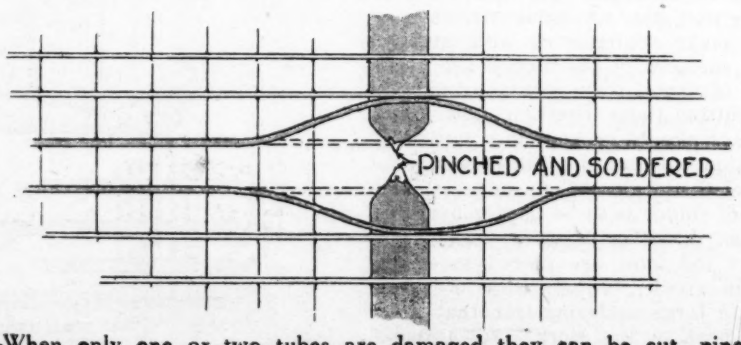


Fig. 4—When only one or two tubes are damaged they can be cut, pinched and soldered as shown, this will prevent the radiator from leaking. When more than three or four tubes are injured this method is not recommended because the capacity of the radiator is reduced

Electric System

ARMATURE TESTING

Q—Explain best method of testing starting motors, that is, the armature fields and the torque. I have a model MF Auto-Lite starter that will turn a four-cylinder engine over three or four times after the engine is warmed up. I took off the starter, cleaned the armature, under cut the mica, tested the armature with a voltmeter for ground, also for open coils at 180 deg. and a bank of seven carbon lights; also tested each field coil for ground and open and soldered connection for ground. The brushes and starter switch make proper connections. On this system the ground from the battery goes to the starter.—Ray Filler, Racine, Wis.

Practically all starting motors are of the series type, which means that any current flowing through the armature must also flow through the field coils. This means that the field coils will be of rather ??????? wire and can be easily tested by picking out the lead terminal from each coil and passing a current through it. This can be conveniently done by inserting in series with the coil a lamp that is connected to the 110-volt line. If the lamp lights, the field coil is in good condition in all probabilities. Although it should be remembered that is not a positive test as to whether or not the coil is any good. The current may pass through the coil but not through the whole of the coil. In this event the lamp would light and to all appearance the coil would be in good shape.

For testing the torque of the motor you will need a scale with a lever secured to the shaft of the motor. This can be done by clamping a stout metal bar, preferably flat, to the end of the gear, as shown in the illustration, Fig. 5. Two C-clamps can be used for this purpose. A wood bar will do just as well if the metal bar is not available, but it must be rather strong, for there is quite a turning effort impressed on the bar.

Now measure from the point on the bar that will coincide with the center of the motor shaft, 1 ft. to the end of the bar. At this point place a stout screw eye. Now by hanging a scale on a bracket and hooking it to the screw eye, bearing in mind that when the motor exerts a force, it must pull down, the pull can be very easily measured. Take a Remy generator, for example, of the type 187-A. The starting motor will be standing still during this test, that is, it will not be burning. This is called the lock torque test. With a 1 ft. radius, the motor will pull something like 30 to 32 pounds, providing a good storage battery is used. The current flow during the test will be about 590 to 620 amperes, and a voltmeter connected across the terminals of the motor will measure about 3.2 volts. In this way one can get a fairly accurate idea of just what the motor is doing? If the pull is good, like that specified above, then the motor is in A-1 condition.

STARTING MOTOR TROUBLE

Q—Thinking I understood the battery problem fairly well I made over a battery and charged it to about 1300 and installed it in a Stevens car. At times it would start the engine easily, then it would not turn it over, even when warm. It is charged up to 1250 all the time. What is the trouble, and remedy?—River Road Garage, Tiffin, Ia.

The source of trouble is probably in the starting circuit and not the battery. The Delco system is used on this car and the trouble may be at the brushes. When the starting motor is operating one of the three brushes should lift from the commutator. If there is sticky grease that is holding the brush down, there is a load placed on the generator because this brush is transmitting current to the ignition system, and at the same time the starting motor is attempting to turn over the engine. Remove the cover so you can get at the brushes, clean the commutator and the brush arms and watch the brush action when the starting motor is in operation.

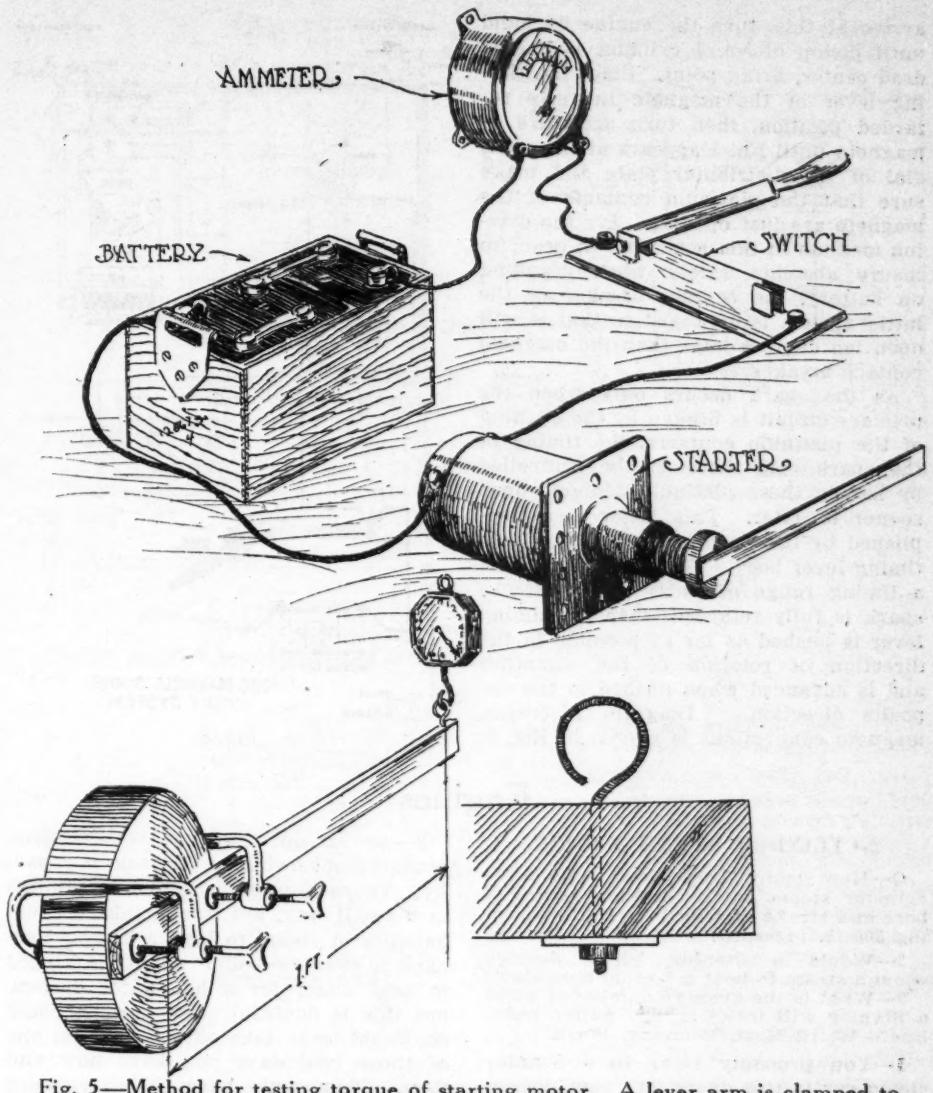


Fig. 5—Method for testing torque of starting motor. A lever arm is clamped to the gear and the end of the arm hooked to a spring balance

MAXWELL WIRING

Q—Publish wiring diagram of the 1920 Maxwell.

2—Publish internal connections to generator, relay and switches.—John Williams, Acton, Ind.

1 and 2—See Fig. 7.

FORD HIGH-TENSION MAGNETO

Q—Would a K-W high-tension magneto be practical for a Ford? If so, where could I secure gear to connect it and what would be the cost?—Ben Zimmerman, Flatwillow, Mont.

The installation of any high-tension magneto would be very desirable and the manufacturers of the one you decide to install can furnish you with the necessary attachments.

REMOVING GENERATOR GEAR

Q—Suggest a way to remove the gear from an Auto-Lite generator on a 1915 Overland 83.—F. T. Qualman, Milwaukee, Wis.

You will find that the gear is keyed to the shaft and the generator will have to be removed and disassembled before the gear can be removed. When the armature and shaft is removed it can be placed in a vise and the gear forced off.

SETTING TIMING GEARS

Q—Publish wiring diagram of the Empire 31.

2—Instruct how to set the timing gears. —J. J. Vorndran, Fort Wayne, Ind.

1—Wiring diagram of the Empire 31 is shown in Fig. 8.

2—As the spark occurs when the primary circuit is broken by the opening of the platinum contacts, it is necessary that the magneto will be so timed that at full retard the platinum contacts will open when the piston has reached its highest point on the firing stroke. To

arrive at this, turn the engine by hand until piston of No. 1 cylinder is on the dead center, firing point. Place the timing lever of the magneto in fully retarded position, then turn armature of magneto until No. 1 appears at the glass dial of the distributer plate and make sure that the platinum contacts of the magneto are just opening. Fix the driving medium in this position. In order to insure absolute safety when cranking on battery, the contact breaker of the latter system is arranged so that it will open ten degrees later than the magneto contact breaker.

As the spark occurs only when the primary circuit is broken by the opening of the platinum contacts, the timing of the spark can, therefore, be controlled by having these platinum contacts open sooner or later. This latter is accomplished by the angular movement of the timing lever body. This movement gives a timing range of thirty degrees. The spark is fully retarded when the timing lever is pushed as far as possible in the direction of rotation of the armature and is advanced when pushed in the opposite direction. Diagram Eisemann magneto connections is shown in Fig. 6.

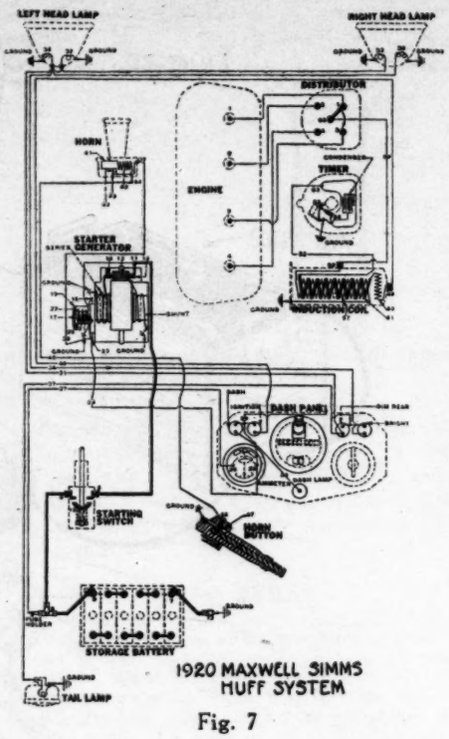


Fig. 7

Engines

2-CYLINDER STEAM ENGINE

Q—How many horsepower will a 2-cylinder steam engine develop having a bore and stroke of 4 by 5 in. boiler carrying 500 lb. pressure?

2—Would a Stanley boiler develop enough steam to heat a 5-room bungalow?

3—What is the average number of miles a Stanley will make on one gallon gasoline?—W. H. Mast, Pomeroy, Wash.

1—You probably refer to a Stanley steam car in this query, but your dimensions are not quite correct, for while the bore is 4 in. and the stroke 5 in. the boiler pressure is 550 lbs. and not 500 lbs. At the corrected figure the engine will show 20 hp.

2—As an out and out steam plant, probably not owing to the lack of capacity. There is pressure and heat enough in a small way, but it will take a great quantity of steam to heat a house. Perhaps a Stanley boiler might be rigged to heat water for a hot water system, but this is doubtful. The most it could do would be to take off the chill on one of those cool days you have now and then. This would have to be arranged like a hot water heater, so the water could be circulated at all times.

3—The Stanley does not use gasoline; it will travel about 12 m.p.g. of kerosene, however.

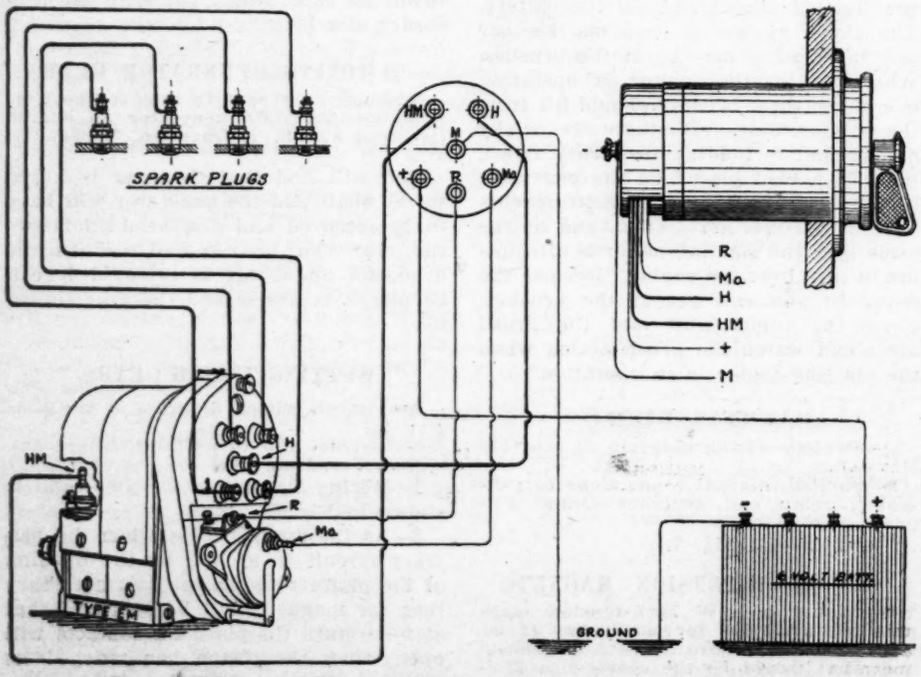


Fig. 6—Wiring of Eiseman dual magneto used on the Empire 31

FIAT TRANSMISSION ADJUSTMENT

Q—Publish sketch and give adjustments on 1914 foreign Fiat "Baby" car transmission. A rattling noise occurs apparently between the engine and the rear axle when the car is traveling from 18 to 20 m.p.h.—R. A. Cade, New York.

In Fig. 9 you will find an illustration of the gearset used in this Fiat car. There are only two adjustments that you can make, other adjustment must be made by installing new bearings. If the bearings are worn or the races worn slightly the end play so occasioned can be taken up by moving the collars marked A and B. However, if the wear is excessive it is just as probable that this can also be noticed in the ball bearings, for the races are made about as hard as the bearings themselves.

TIMING INDIAN MOTORCYCLE

Q—A 1915 Indian Motorcycle was taken apart without first marking the gears on the crankshaft and the camshaft so the valves are out of time. Explain how to obtain correct timing.—Wilber L. Jerman, Silver Spring, Md.

The basis for obtaining the correct valve and ignition setting on this motorcycle engine is to set the valves so that the forward cylinder is the one measured on. The timing gears should be arranged so that the intake valve started to open when the piston has descended about 1/16 in. The real measurement is slightly less than this, being something like 3/64 in. After obtaining this setting the rest of the cycle will set itself, so to speak. The cams are already ground and unless you change the relative opening and closing periods on the surface of the cam the timing will remain as it was.

To set the ignition place the spark grip in its center position and with the piston at top dead center and both intake and exhaust valves closed set the breaker points where they will open at this position.

OVERSIZED PISTONS

Q—The 30-60 twin cylinders of a tractor were rebored, which changed the dimensions from a 9 in. bore to a 9⅛ in. bore. New pistons were installed weighing 67 lb., which is 10 lb. more than the old ones weighed. Does the extra 10 lb. weight on the pistons cut the power down? It may be possible to reduce the weight probably 3 lb. on each piston by boring the inside out. Will this help?—Frank Sefrik, Cuba, Kansas.

On a comparatively slow speed engine as this is the added weight to the piston will not make a very material difference in the operation, but the weight of each piston must be the same. Boring out the inside of the piston as you suggest will help a good deal and cut down on the excess bearing pressure.

CLUTCH BRAKES THE ENGINE

Q—On a Hupmobile car, model 20, when the clutch is released it puts a brake on the engine and if the engine is not speeded up to excessive speed, will kill it before car is started. How can the clutch be adjusted or what is the cause of this trouble?—R. A. Black, De Kalb, Ill.

This trouble comes from a binding pilot bearing, which may be broken or rusted or lacking in lubricaton. This is in the hub of the flywheel and carries the pilot shaft. If this cannot rotate

freely, then when you throw out the clutch and automatically set the clutch brake you are setting a brake against the engine, which you would not do if the bearing were functioning properly. It will be necessary to remove and loosen up or replace the bearing. This, of course, calls for removal of the transmission and clutch to gain access to the bearing.

AMERICAN VALVE-IN-HEAD ENGINES

Q—Publish names of the makes of foreign or American cars using a valve-in-head type engine. Also various airplane type engines using the valve-in-head principle.—R. H. Roys, National Motor Sales Co., Chicago.

The list of American-made cars using valve-in-head engines embraces Buick, Chevrolet, Dorris, Elgin, Franklin, Grant, Harroun, Haynes, Holmes, Maibohm, Nash, National, Nelson, Oakland, Oldsmobile, Porter, Premier, Roamer, Scripps-Booth, Singer, Stephens, Templar and Velie. In a few cases, for instance, the Velie, other types are also used. MOTOR AGE has no record of the specifications of all foreign cars, but since the war there has been a strong tendency toward using valve-in-head engines and many were used before the war, notably in racing cars.

KISSEL OILING SYSTEM

1—Publish diagram explaining oiling system of a 4 cylinder 4⅞ by 5¾-in., right hand drive, Kissel Kar.

2—I have a 4-cylinder, right hand drive Kissel Kar using a 4⅞ in. by 5¾ in. Wisconsin engine, equipped with a Master carbureter, Bosch high-tension magneto and coil, of German make. The car has a four speed transmission, driving direct in third. Could you tell me what the ratio is in fourth?—C. R. Keller, Toledo, Ohio.

1-2—The Kissel company advises that it never made a car embodying 4⅞ by 5¾ in. Wisconsin engine of the four-cylinder type. The suggestion is made that possibly the original engine has been replaced by the Wisconsin power plant. It will, therefore, nevertheless, be necessary to know the number of the car to procure the data required. The Wisconsin Motor Co., of Milwaukee, can give the data on the oiling system, but it will be necessary for us to have the car number for the rest.

OIL FOR HAYNES

Q—How much oil should be put in the sump of a Haynes 30 light six?—Raymond F. Mausert, Gloucester City, N. J.

You will find an oil level gage and this will indicate how much may safely be put into the crankcase. It is well to have a factory instruction book to guide you in such cases. The exact quantity amounts to about 6 or 7 quarts.

EXCELSIOR VALVE TIMING

Q—Publish valve timing of the 1914 Excelsior twin cylinder engine.—Robert Larson, Boelus, Nebr.

You will find by removing the gear box cover, that the gears are marked with arrows as follows: The small pinion gear connected direct to the engine shaft has two arrows stamped on the face of the teeth. The next large cam gear has one arrow. These should be so placed that the one arrow on the large gear intersects the two on the small one in a direct line. After getting them in this position, do not disturb while following out the balance of the instructions.

The idler gears in between the two last mentioned and the magneto gear are not marked and are not directly responsible for the timing. The large magneto gear has one arrow, and on the face of the gear box where the gasket is placed at the forward end, you will find a mark similar to an arrow. Slip out the idler gear next to the magneto gear, turn the magneto gear around until the arrow on it comes directly opposite the one on the gear box face, then slip in your idler gear without having disturbed the first two settings, and your engine will be in time.

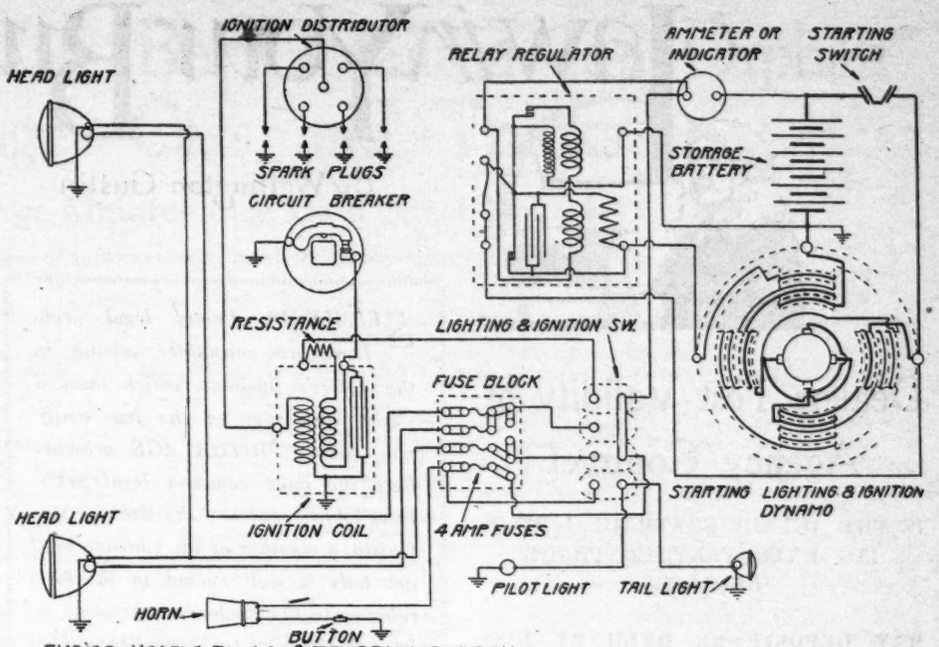


Fig. 8

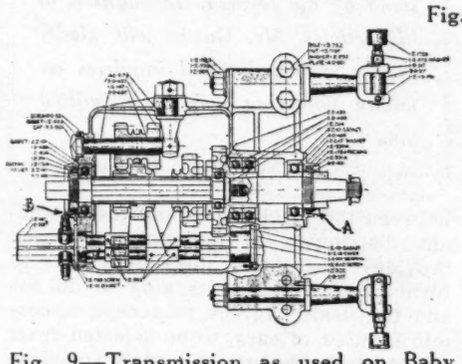


Fig. 9—Transmission as used on Baby Fiat, 1914 model

16 VALVE STUTZ

Q—What is the maximum engine speed and horsepower of the sixteen valve Stutz?—D. H. Keiser, Jr., Co., Reading, Pa.

The Stutz 16-valve develops 90 hp. at 3000 r.p.m.

LAPPING IN PISTONS

Q—In lapping in new pistons are the old pistons used to do the lapping with or the new oversize ones? On a car of 3⅞ in bore is .004 enough clearance?

2—Would 1919 or 1920 pistons fit in a 1917 Studebaker? They have the same size bore. Would the wrist pin be the same?

3—Do they make Studebaker pistons more than .005 in. oversize?

4—How much out of round can a cylinder be before it is necessary to regrind or rebore it?

5—The exhaust valves become pitted so as to need grinding about every 1200 miles. Should this be necessary for this short distance?—F. J. Norris, Detroit.

1—When lapping in new pistons no dummy is used, but the oversized pistons themselves are used. The clearance for cast iron pistons is .001 in. diameter of the piston in inches at the skirt and should be increased .001 for each land as you travel up the piston.

2—We have no information as to the design of the pistons used in the Studebaker car, but it is quite likely that design has been changed. This information can be obtained from the Studebaker Co.

3—There are four sizes of oversized pistons that most manufacturers are prepared to furnish, having been adopted by the S. A. E. for rebored cylinders. These are .010 in., .020 in., .030 in., .040 in., larger than the regular dimensions.

4—This is a question in which there can be a great deal of variation. The engineers of some companies who make a business of regrinding cylinders claim that an engine that is run for a long time works the parts into perfect alignment, and that if this engine is torn down and reassembled even though the parts have not been changed, will often result in a great loss of compression and regrinding will be necessary. It is safe to say that if the cylinders are found to be .003 or .004 out of round at the top regrinding is absolutely necessary.

5—It should not be necessary to regrind the valves every 1200 miles. This excessive carbon deposit may be caused by poor carburetion or oiling conditions. Often the kind of oil and the amount used will cause a very heavy carbon deposit. Check up the carburetion to see if you have too rich a mixture, see that the ignition is functioning properly and examine the oil.

Law in Your Business

By Wellington Gustin

SEEMINGLY knotty legal problems are constantly arising in the dealer's business, which even a slight knowledge of the law easily may solve. MOTOR AGE presents here the most common legal problems which confront the dealer. Mr. Gustin, a member of the Chicago bar, not only is well versed in the law relating to the dealer but presents it in such a way as to be readily understood by the layman. In addition to his articles, Mr. Gustin will gladly answer such individual inquiries on knotty points as may be submitted him.

Dealers Test Validity of Agency Contract

IS THE AGENCY CONTRACT A BINDING EXECUTORY CONTRACT OF SALE?

MAY DEPOSIT BE HELD BY DISTRIBUTOR FOR FAILURE TO SPECIFY AND ORDER OUT CARS?

The question of a dealer's contract with the distributor of automobiles was before the Court of Appeals of Georgia in a case just decided. This court held that a dealer's contract is not a binding executory contract of sale until he specifies the automobiles or other goods to be furnished; and if he fails to give such directions he may, nevertheless, recover his deposit made under the contract.

Chiver and Aultman brought an action to recover their dealer's deposit of $250 deposited with the defendant, A. C. Tift, as a bonus, in accordance with the provisions of a dealer's contract entered into between them, which contract, under authority contained therein, had been cancelled by the distributor, and which provided that upon its cancellation by either party the distributor was to return this deposit to the dealers, or so much thereof as should remain due, after applying such part of the deposit as might be necessary to settle and pay all indebtedness and claims owing by the dealers to the distributor.

The distributor set up as a defense to the suit certain damages alleged to have been sustained by him because of the failure of the dealers to order out and pay for certain automobiles under contract. He contended further that the suit for the deposit could not be maintained, for the reason that the dealers had not themselves complied with the contract.

In deciding the questions, the court said that an executory contract for the future sale of a commodity is not enforceable, unless by the terms of the agreement it is so intended, and there is mutuality of obligation and certainty as to the subject matter and price. Under the rule just stated, a dealer's contract, establishing such a relationship between the local dealer and the defendant distributor of automobiles, which provides that the distributor is to furnish (provided he is able to do so) and the dealer agrees to accept, a certain number of cars, to be selected from an attached schedule of models at prices which are subject to change by the distributor does not constitute a binding executory contract of purchase and sale. In such a contract it is necessary that the dealer should, during the life of the contract, particularly specify the cars which are to be thus furnished, in order to consummate the agreement as one of absolute purchase and sale. Overland Motor Car Co. vs. Hill, 89SE833. Especially is this true where it is also provided that either party had the arbitrary right to cancel the agreement on notice at any time.

On the proposition that because the dealers had not performed as to their part of the contract, therefore, they could not recover under it, the court said that while it is the general rule that a party claiming solely under and by virtue of the terms of an alleged executed contract must show performance on his own part, still, the expressed purpose and intent of the contract being considered, and the agreement being unfinished as to any purchase and sale, the failure of the dealer to specify and order out any of the cars would not, therefore, constitute such non-performance on his part as would prevent a recovery by him of the bonus paid in under the terms of the dealer's contract, nor could such failure be pleaded by way of damages in answer to such a suit.

Dealers Reserves Title By Means of Notes

ASSIGNEE OF PURCHASER STANDS IN SAME SHOES OF PURCHASER —MAY NOT RECOUP MONEY PAID TO PURCHASER FROM DEALER

In another Georgia case a dealer sold a car to Jackson or Banks; the evidence was in conflict as to just which one was the purchaser. However, both signed six promissory notes, covering part of the purchase price of the car. The notes retained title to the car in the dealer, and the last one, referring to the other notes of the series and containing all the stipulations as to the conditions of the sale, was duly recorded. Banks made a cash payment on the car at the time it was purchased, and later paid two of the notes. It appears that Jackson never paid anything on the purchase price of the car, yet he sold it to defendant Ray, and the dealer brought suit to recover the automobile from Ray.

A judgment in the lower court gave the dealer the car, but gave Ray a judgment for money out on his purchase from Jackson. On appeal the court found that the recorded notes reserved title to the property in the dealer until the full payment of the purchase money. Again it said where two persons sign such notes as purchasers, but one of them fails to pay any of the purchase money, a purchaser of the property from the one who has paid nothing would acquire nothing as against the original seller. Ray, who was the purchaser of Jackson, could occupy no better legal position than his seller, Jackson, who had never paid anything on the purchase price of the car, therefore, the dealer should not have to stand responsible for any money paid by Ray to Jackson.

CHASE GETS BEEMAN TRACTOR FOR CANADA

Toronto, Ont., April 26—The Chase Tractor Corp. has been appointed Canadian distributor for the Beeman Tractor Co. of Minneapolis. While the present arrangements is only a distributing one, the Chase corporation eventually will manufacture the Beeman tractor in a Toronto plant.

Where Parts Can Be Obtained for Orphan Passenger Cars and Trucks

Motor Age Maintenance Data Sheet No. 94

One of a series of weekly pages of information valuable to service men and dealers—save this page

Croxton-Keeton
Auto Gear Co., 844 Eighth Ave., New York.
Auto Gear & Parts Co., 291-93 Marietta St., Atlanta.
Auto Salvage & Exchange Co., 1317-19 Locust St., Des Moines.
Dayton Auto Parts Co., 1777 Broadway, New York.
Puritan Machine Co., 409 Lafayette Blvd., Detroit.

Cutting
Auto Gear Co., 1404 Hennepin Ave., Minneapolis.
Auto Gear Co., 844 Eighth Ave., New York.
Auto Gear & Parts Co., 291-93 Marietta St., Atlanta.
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.
Auto Salvage & Exchange Co., 1317 Locust St., Des Moines.
Erbes, L. C., 3654 W. University Ave., St. Paul.
Gorey & Co., Jos. C., 354 W. 50th St., New York.
Puritan Machine Co., 409 Lafayette Blvd., Detroit.
Sattler's Machine Shops & Works, 1601 Spring Garden St., Philadelphia.
Service Gear & Machine Co., Reading, Pa.
The Boneyard, Washington, Ia.
Wolf Auto Parts & Tire Co, I., 619 N. Illinois St., Indianapolis.
Wycoff Auto Salvage Co., Sioux City, Ia.

Demot
Puritan Machine Co., 409 Lafayette Blvd., Detroit.

De Tamble
American Motors Parts Co., Indianapolis.
Auto Gear Co., 844 Eighth Ave., New York.
Auto Gear & Parts Co., 291-93 Marietta Ave., Atlanta.
De Tamble Motors Co., Washington Ave. and Geisendorff St., Indianapolis.
Puritan Machine Co., 409 Lafayette Blvd., Detroit.

Detroiter
Auto Gear & Parts Co, 291-93 Marietta Ave., Atlanta.
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.
Detroiter Motor Car Co., Detroit.
Standard Motor Parts Co., New Castle, Ind.
The Boneyard, Washington, Ia.
Wichita Auto Wrecking Co., 801 W. Douglas Ave., Wichita.
Wycoff Auto Salvage Co., Sioux City, Ia.

Diamond
Auto Gear Co., 844 Eighth Ave., New York.

Drexel
Auto Auction Co., 519 W. Jackson Blvd., Chicago.
Auto Gear & Parts Co., 291-93 Marietta Ave., Atlanta.

Drummond
Auto Gear & Parts Co., 291-93 Marietta Ave., Atlanta.

Dupont
Auto Gear & Parts Co., 291-93 Marietta Ave., Atlanta.
Victor Motor Co., York, Pa.

E. M. F.
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.
Carey & Davis, 486 Louisiana Ave., Washington, D. C.
Gorey & Co., Jos. C., 354 W. 50th St., New York.
Puritan Machine Co., 409 Lafayette Blvd., Detroit.
Sattler's Machine Shops & Works, 1601 Spring Garden St., Philadelphia.
Service Gear & Machine Co., Reading, Pa.
Studebaker Corp., of America, Detroit.
The Boneyard, Washington, Ia.

Edwards-Knight
Dayton Auto Parts Co., 1777 Broadway, New York.
Willys-Overland, Inc., Toledo.

Elmore
Auto Gear Co., 844 Eighth Ave., New York.
Auto Gear & Parts Co., 291-93 Marietta St., Atlanta.
Auto Parts Co., 4116-18 Olive St., St. Louis.
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.
Auto Salvage Co., 1701 Main St., Kansas City.
Gorey & Co., Jos. C., 354 W. 50th St., New York.
Puritan Machine Co., 409 Lafayette Blvd., Detroit.
Wolf Auto Parts & Tire Co, I., 619 N. Illinois St., Indianapolis.

Empire
Auto Gear Co., 1404 Hennepin Ave., Minneapolis.
Auto Gear Co., 844 Eighth Ave., New York.
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.
Empire Auto Co., Indianapolis.
Sattler's Machine Shops & Works, 1601 Spring Garden St., Philadelphia.
The Boneyard, Washington, Ia.
Wolf Auto Parts & Tire Co, I., 619 N. Illinois St., Indianapolis.

Enger
Auto Gear Co., 844 Eighth Ave., New York.
Auto Gear & Parts Co., 291-93 Marietta Ave., Atlanta.
American Motors Parts Co., Indianapolis.
Enger Motor Car Co., Indianapolis.
Erbes Motor Car Co., L. E., 2654 W. University Ave., St. Paul.
Wichita Auto Wrecking Co., 807 W. Douglas Ave., Wichita.

Everett
Auto Gear Co., 1404 Hennepin Ave., Minneapolis.
Auto Gear Co., 844 Eighth Ave., New York.
Auto Gear & Parts Co., 291-93 Marietta Ave., Atlanta.
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.
Auto Parts Co., 4116 Olive St., St. Louis.
Dayton Auto Parts Co., 1777 Broadway, New York.
Gorey & Co., Jos. C., 354 W. 50th St., New York.
Puritan Machine Co., 409 Lafayette Blvd., Detroit.
Sattler's Machine Shops & Works, 1601 Spring Garden St., Philadelphia.
Service Gear & Machine Co., Reading, Pa.
Standard Motor Parts Co., New Castle, Ind.

F. A. L.
Auto Gear Co., 844 Eighth Ave., New York.
Auto Gear & Parts Co., 291-93 Marietta Ave., Atlanta.
Auto Salvage Co., 1701-03 Main St., Kansas City.
Auto Salvage & Exchange Co., 1317 Locust St., Des Moines.
Puritan Machine Co., 409 Lafayette Blvd., Detroit.
Wichita Auto Wrecking Co., 807 W. Douglas Ave., Wichita.

Firestone Columbus
Auto Gear Co., 844 Eighth Ave., New York.
Auto Parts Co., 2801 Preston Ave., Houston, Tex.
Columbus Buggy Parts Co., Columbus, O.
Wichita Auto Wrecking Co., 801 W. Douglas Ave., Wichita.

Fisher
Auto Gear & Parts Co., 291-93 Marietta Ave., Atlanta.

Flanders
Auto Gear Co., 844 Eighth Ave., New York.
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.
Auto Parts Co., 4116 Olive St., St. Louis.
Auto Salvage Co., Tulsa, Okla.
Dayton Auto Parts Co., 1777 Broadway, New York.
Levene Motor Co., 409 Lafayette Blvd., Detroit.
Puritan Machine Co., 409 Lafayette Blvd., Detroit.
Sattler's Machine Shops & Works, 1601 Spring Garden St., Philadelphia.
Service Gear & Machine Co., Reading, Pa.
Standard Motor Parts Co., New Castle, Ind.
Studebaker Corp. of America, Detroit.
The Boneyard, Washington, Ia.

Flanders Electric
Levene Motor Co., 2200 Diamond St., Philadelphia.

Garford
Auto Parts Co., 2801-28 Preston Ave., Houston, Tex.
Elyria Belting & Machine Co., Elyria, O.
Puritan Machine Co., 409 Lafayette Blvd., Detroit.

Glide
Auto Gear Co., 1401 Hennepin Ave., Minneapolis.
Auto Gear Co., 844 Eighth Ave., New York.
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.

Great Western
Auto Gear Co., 844 Eighth Ave., New York.
Auto Gear & Parts Co., 291-93 Marietta Ave., Atlanta.
Auto Salvage & Exchange Co., 1317 Locust St., Des Moines.
Great Western Auto Co., Kalamazoo, Mich.
Puritan Machine Co., 409 Lafayette Blvd., Detroit.
Wichita Auto Wrecking Co., 801 W. Douglas Ave., Wichita.
Wolf Auto Parts & Tire Co., I., 619 N. Illinois St., Indianapolis.

H. A. L.
Auto Gear & Parts Co., 291-93 Marietta Ave., Atlanta.
Standard Motor Parts Co., Detroit.

Hatfield
Auto Gear & Parts Co., 291-93 Marietta Ave., Atlanta.

Havers
Auto Gear Co., 844 Eighth Ave., New York.
Auto Gear & Parts Co., 291-93 Marietta Ave., Atlanta.
Auto Salvage & Exchange Co., 1317-19 Locust St., Des Moines.
Dayton Auto Parts Co., 1777 Broadway, New York.
Gorey & Co., Jos. C., 354 50th St., New York.
Puritan Machine Co., 409 Lafayette Blvd., Detroit.
Sattler's Machine Shops & Works, 1601 Spring Garden St., Philadelphia.

Henderson
Auto Gear Co., 1404 Hennepin Ave., Minneapolis.
Auto Gear Co., 844 Eighth Ave., New York.
Auto Gear & Parts Co., 291-93 Marietta Ave., Atlanta.
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.
Auto Salvage Co., 1701-03 Main St., Kansas City.
Buda Co., Harvey, Ill.
Gorey & Co., Jos. C., 354 W. 50th St., New York.
Henderson Motor Car Co., Detroit.
Puritan Machine Co., 409 Lafayette Blvd., Detroit.
Service Gear & Machine Co., Atlanta.
Smith Corp., A. O., Milwaukee.
Standard Motor Parts Co., Detroit.

Halladay
Auto Gear Co., 1404 Hennepin Ave., Minneapolis.
Auto Gear Co., 844 Eighth Ave., New York.
Auto Gear & Parts Co., 291-93 Marietta Ave., Atlanta.
Barley Motor Car Co., Kalamazoo, Mich.
Wichita Auto Wrecking Co., Wichita.

Hercules
Auto Gear & Parts Co., 291-93 Marietta Ave., Atlanta.

Herff-Brooks
Auto Salvage Co., 1701-03 Main St., Kansas City.
Wayne Works, Richmond, Ind.

Herreshoff
American Motors Parts Co., Indianapolis.
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.
Auto Parts Co., 4116-18 Olive St., St. Louis.
Gorey & Co., Jos. C., 354 W. 50th St., New York.
Puritan Machine Co., 409 Lafayette Blvd., Detroit.
Wichita Auto Wrecking Co., 801 W. Douglas Ave., Wichita.
Wolf Auto Parts & Tire Co., I., 619 N. Illinois St., Indianapolis.

The Accessory Corner

New Fitments for the Car

Tri-Co Shock Absorber

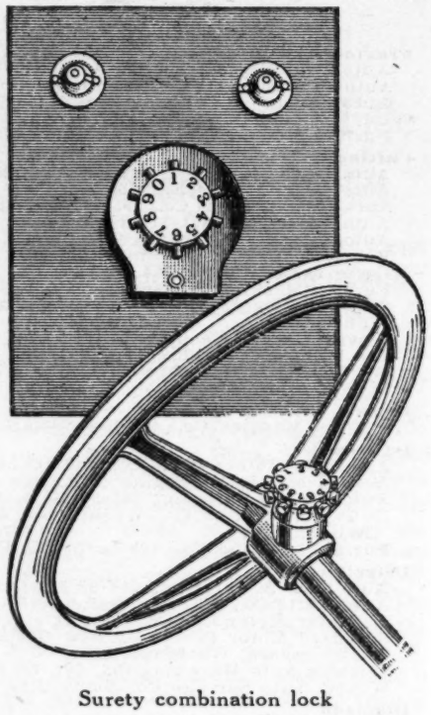
Shock absorbers always materially aid the comfort of driving and reduce the wear on the car. The Tri-Co shock absorber manufactured by the Tri-Continental Corp., Buffalo, is designed for Ford cars and trucks. The attachment consists of a clip fastener around the front axle which fits closely into the channel and a bracket which attaches to the frame by removing the nut which holds the front lamp. Shock absorber is pointed coil forward as shown in the illustration so that practically the entire mechanism is invisible. The price, complete set front and rear, ready to attach is $15.

Surety Automobile Lock

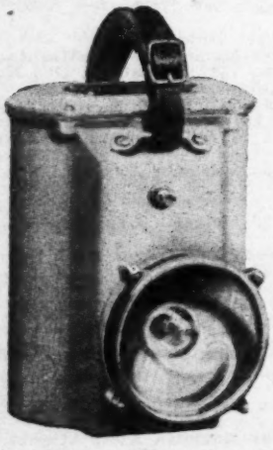
The Surety motor car lock is of the combination type that can be fitted to a Ford car or any other car. In the case of the Ford the lock is attached to the coil box and in the case of other cars the lock is fitted to the steering wheel, as shown in the illustration. The lock is of the combination type, and is fitted with twelve buttons for the combination. With these twelve buttons something like 29,000 combinations are available and it is entirely up to the owner whether or not he wants to change the combination number, for this can be accomplished in ten minutes' time. When the lock is fitted to the steering gear, the steering column is locked to the post, thus preventing the wheel from being turned. This lock is made by Geo. Wehner, 420 Habersham Street, Savannah, Ga.

Above—Melotone compression whistle gives a melodious warning

Left — Hughes brake lever extension for attachment to the Ford relieves the tiresome reaching for the lever



Surety combination lock



Grether electric searchlight

Hughes Brake Lever Extension

A device that means much to the comfort of Ford drivers is the brake lever extension just brought out by the Hughes M & H Novelty Co., 1470 West 28th St., Los Angeles.

This firm has long been making the Hughes (Mellin) gear shift lever extension for every make of car but Ford. Now they have adapted the device to relieve the tiresome reach forward for the Ford brake lever, bringing it 6 in. or so nearer than the stock model permits.

Being itself adjustable, the Hughes extension places a ball grip at the point most convenient to the individual driver's arm length, obviating exertion or inconvenience in manipulating the lever.

Melotone Compression Whistle

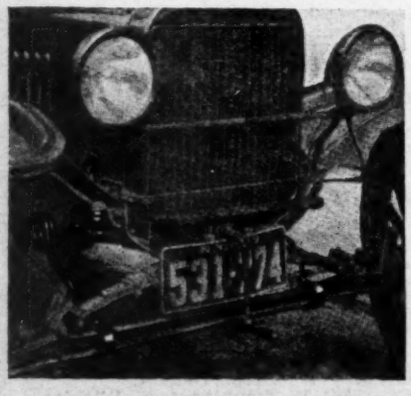
The whistle shown gives a triple tone blending. It is a melodious warning signal and lends some distinction to the motor car. The Melotone is made of brass, of simple scientific construction that contains no mechanism that can get out of order. It sells for $6 and is made by Duplex Machine Co., Newark, N. J.

Duplex Double Spring Bumper

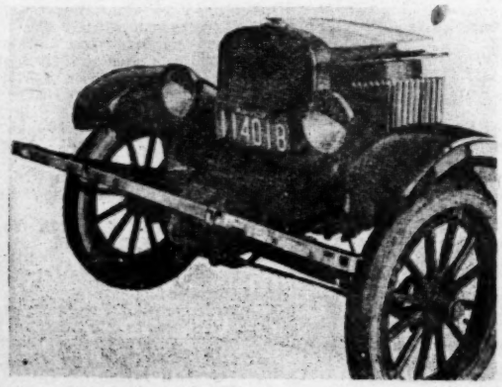
The bumper shown in the illustration was recently patented and placed on the market by the Duplex Machine Co., Newark, N. J. It is claimed that no matter at what point of guard a blow is received the double action of the springs brings it back to its original position. The features are graceful design, good finish, easy installation without cutting or disfiguring any part of the car.

Grether Searchlight

A good, reliable portable searchlight is always a very desirable piece of equipment for "trouble shooters" such as telephone, telegraph, electric light companies, service stations, etc. The lamp shown in the illustration is a very substantial construction, light weight and very convenient to handle. It is manufactured by the Grether Mfg. Co., Dayton.



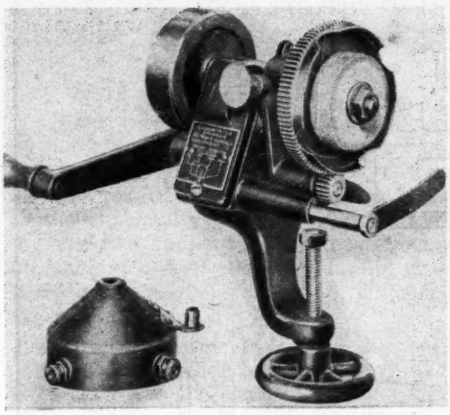
Tri-Co shock absorber for Fords



Duplex double spring bumper

Service Equipment

Time Savers of the Shop



Detroit timer grinder for grinding bearing surface

Battery Charger

The battery has become one of the big features of an up-to-date service station. There is a demand for battery charging service that must be quick and satisfactory. The battery charging outfit shown in the illustration is a ½ kw. motor generator set. The capacity of the generator is 10 amp. 60-70 volts, varied the number of batteries on charge. The switchboard is of clear electrical slate with mountings of ammeter, field rheostat, voltage lamp and two controlling switches. It is manufactured by Hobart Brothers Co., Troy, O.

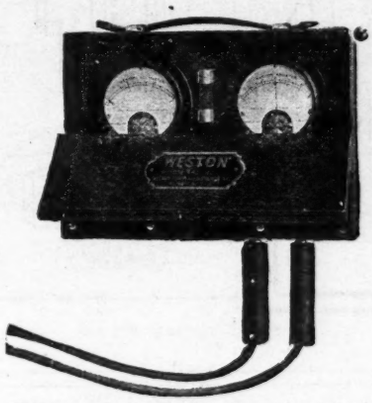
Detroit Timer Grinder

The Detroit timer grinder, manufactured by the Detroit Garage Equipment Co., Detroit, will grind the most worn out timer in a very few minutes, giving it a good surface, keeping the bearing surface perfectly true with the outer shell. With the use of this machine old timers regardless of their makes provided they are of standard type can be made about as good as a new timer with very little expense. This is a very valuable and handy machine and serves a dual purpose, because by removing a chuck and emery wheel and putting on a larger emery wheel the machine can be used for grinding tools.

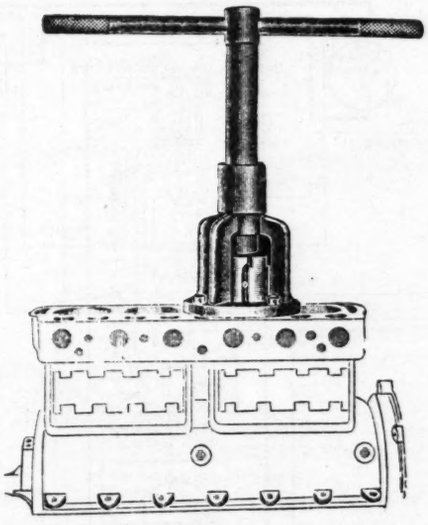
Weston Fault Finder

At the present time practically every car is provided with electric starting and lighting equipment and the garage man is brought face to face with a new phase of his business which he must be prepared to take care of. He must provide himself with proper equipment by means of which he will be able to locate quickly and accurately the troubles that arise.

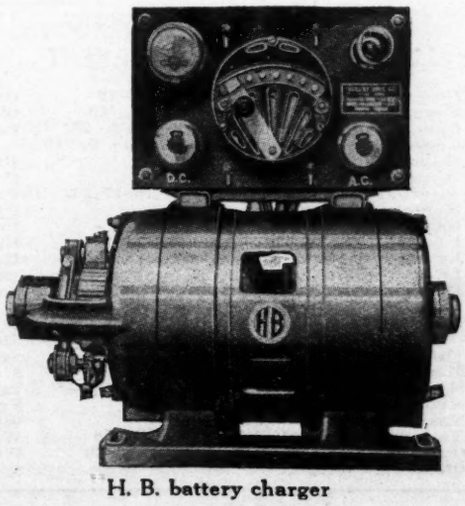
The Weston Electrical Instrument Co. of Newark, N. J., has placed at the command of the garage owner, a fault finder. This device consists of a voltmeter



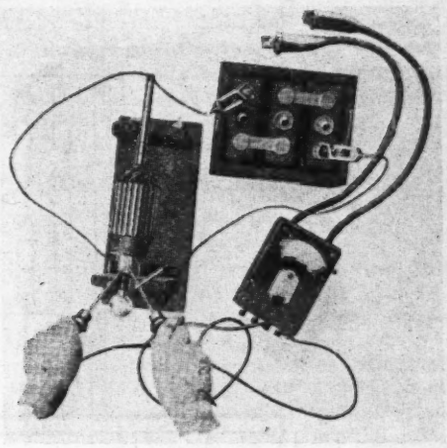
Weston fault finder for electrical equipment



Davis cylinder reboring jig and reamer



H. B. battery charger



Hyrate electro trouble detector

and an ammeter mounted in a compact case with a carrying handle and a hinged cover. All binding posts have been eliminated. Connections between the apparatus being tested and the instrument is made by means of flexible rubber covered tables having plugs on one end which fit into receptacles in the instrument and the spring clips on the other end. The price of this instrument is $33.00 and complete instruction data can be obtained from the makers.

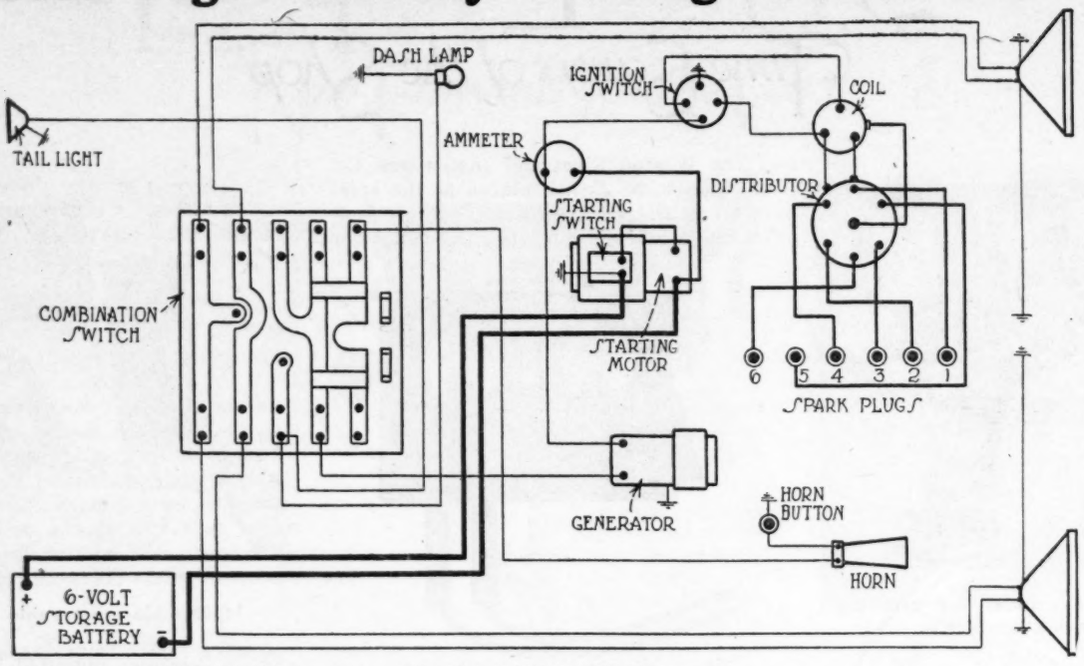
Davis Cylinder Reboring Jig and Reamer

The Davis cylinder reboring jig and reamer shown in the illustration is for use in re-boring Ford cylinders, but the Hinckley Machine Works, Hinckley, Ill., can furnish other sizes to order. The Davis outfit rebores Ford cylinder blocks so the service station men can refit the 1/-32 in. oversize pistons which the Ford company can furnish. It is claimed that one man can rebore a set of four cylinders in 60 min., including all the setting up.

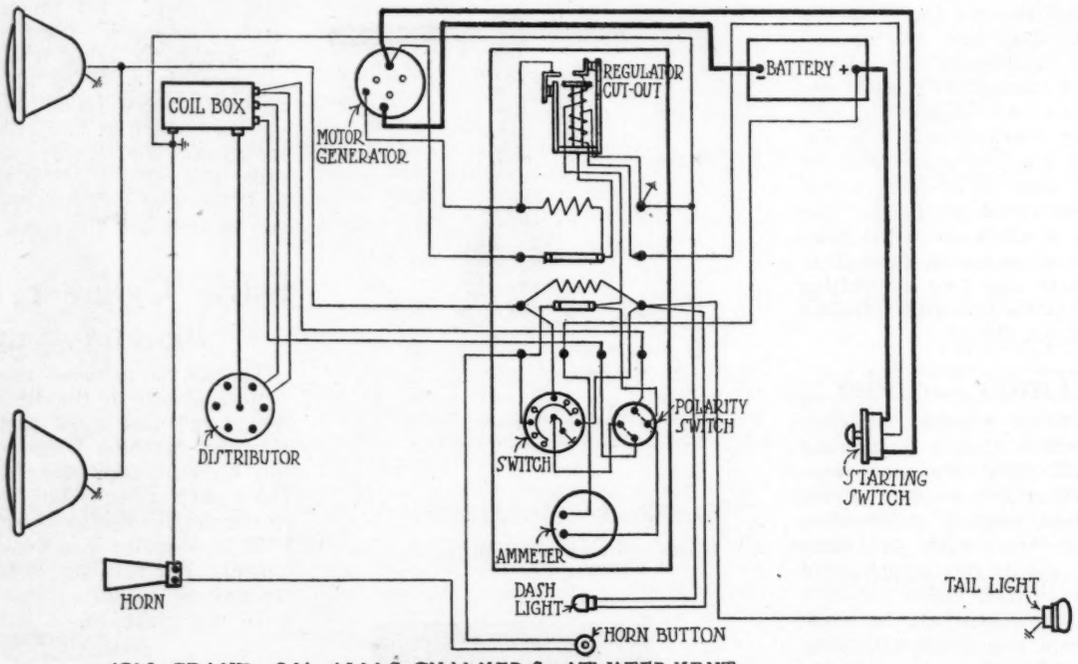
Hyrate Electro Trouble Detector

The Hyrate Electro Trouble Detector is a high-grade portable electrical testing device, combining five instruments in one, a voltmeter reading from zero to 30 volts for testing the generator, lights, horn, etc. a voltmeter reading to 3 volts for battery cell tests; a voltmeter reading from 3 to 10 volts for testing armature and field coils; an ammeter which will measure current up to 300 amperes for testing starting current; and an ammeter reading from 0 to 30 amperes for generator and other low current tests. Made by Service Station Supply Co., Detroit. Price is $42.50.

Motor Age Weekly Wiring Chart No. 75



1916 PAIGE G-6 & H-6 GRAY & DAVIS SYSTEM



1916 GRANT -6 V- ALLIS CHALMERS -ATWATER-KENT

THIS WEEK

1916 Paige

1916 Grant

Allen—Dec. 18, '19
Auburn—Nov. 27, '19; April 1, '20
Briscoe—Oct. 16, '19
Buick—Oct. 23, '19
Cadillac—April 22, '20
Case—Oct. 2, '19
Crow-Elkhart—June 26, '19; April 22, '20
Chalmers—Nov. 27, '19
Cutting—Nov. 6, '19
Daniels—Dec. 4, '19
Davis—Dec. 4, '19
Dixie—April 1, '20
Dodge—April 15, '20
Dorris—Dec. 11, '19
Dort—March 25, '20
Empire—Oct. 30, '19
Essex—Oct. 23, '19; May 15-22, '19
Franklin—June 19, '19; Dec. 11, '19
General Battery Charging—Sept. 25, '19
General Magneto Diagram—June 5, '19
Haynes—Oct. 9, '19
Hupmobile—Oct. 16, '19
Internal Connections—July 10-17-24, '19
Keeton—Nov. 6, '19
King—July 3, '19
Kissel—July 3, '19
Lexington—Jan. 1, '20
Liberty—Jan. 1, '20
Marmon—Dec. 25, '19; Jan. 22,'20
Maxwell—Aug. 14, '19
Mercer—Aug. 28, '19; Nov. 27, '19; March 25, '20
Mitchell—Jan. 8, '20
Monroe—Oct. 30, '19
Moon—Jan. 29, '20; March 11, '20
Moore—March 4, '20
Nash—March 11, '20
National—June 19, '19; Feb. 12, '20
Oakland—Oct. 16, '19; April 15, '20
Oldsmobile—April 8, '20
Olympian—Jan. 22, '20
Owen Magnetic—Sept. 18, '19
Packard—June 19, '19; July 31, '19; March 18, '20
Paige—July 3, '19
Paterson—June 26, '19; July 9, '19
Pierce-Arrow—Oct. 2, '19; Feb. 5, '20
Pilot—March 4, '20
Premier—Dec. 18, '19; Feb. 26, '20
Reo—Aug. 21, '19; Oct. 9, '19; Nov. 13, '19
Roamer—March 18, '20
Saxon—April 8, '20
Scripps-Booth—Jan. 15, '20
Stanley—June 26, '19
Stearns-Knight—Jan. 8, '20
Stephens—Feb. 12, '20
Studebaker—Dec. 25, '19
Stutz—Feb. 5, '20
Templar—Jan. 29, '20
Velie—Sept. 25, '19; Feb. 19, '20
Westcott—Jan. 15, '20
White—Sept. 25, '19; Feb. 19, '20
Willys-Knight—Feb. 26, '20
Special Systems for Fords—May 15-22, '19

The Automotive Repair Shop

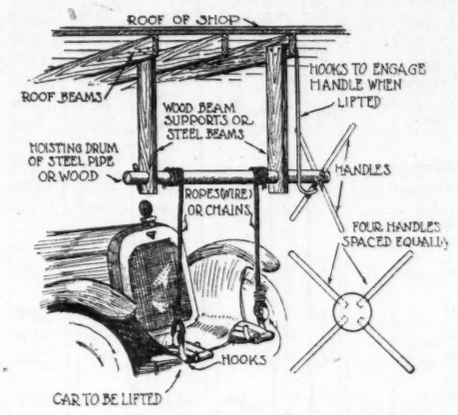
Practical Maintenance Hints

Simple Form of Garage Hoist

A hoist of simple construction is easily made up for use in the garage or repair shop by following the idea shown in the sketch. Suspended from the beams supporting the roof of the building are two supports. These parts can be made of either wooden planking or a more permanent structure is of steel beams.

Rotating in these is a drum like bar, of steel pipe or of wood, to turn the hoisting ropes or chains. At one end of the drum are affixed four long handles to obtain the required leverage, enabling one man to lift either end of a car or truck.

Variations of this idea will enable or permit of using most any discarded parts that the scrap heap affords. A hook is provided to hold the car when lifted to the desired height.



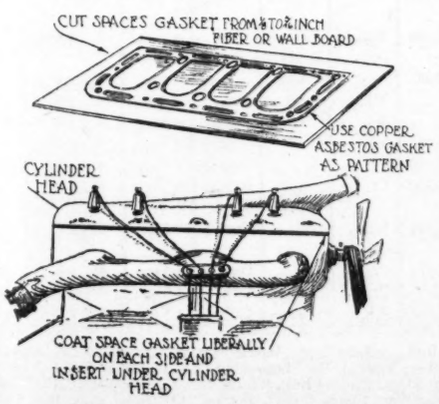
Single garage hoist

Grooved Floor in the Garage Washrack

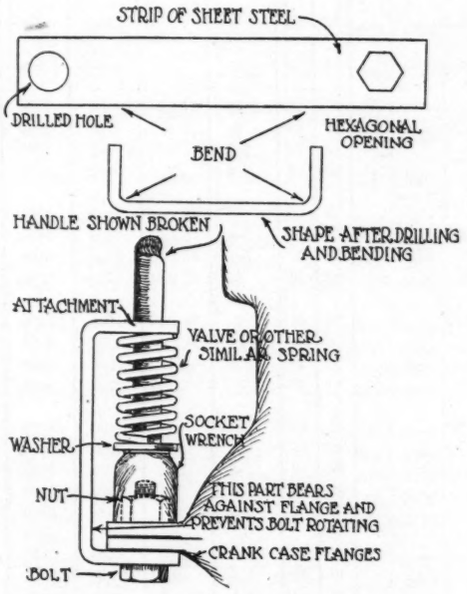
The concrete at the washrack in the garage is invariably wet, even though an hour or more may elapse between times that cars are washed. This in a damp moist condition makes the garage more or less uncomfortable aside from endangering the health of the employees.

A simple solution is possible when the concrete flooring is laid, provide small drain grooves about 6 in. apart, leading to the drain trap. Place a straight edge on the soft concrete, and with the point of the trowel make the small shallow channels.

These will lead the water direct to the drains and the floor will be dry very shortly after using the washrack.


CUT SPACES GASKET FROM 1/8 TO 1/2 INCH FIBER OR WALL BOARD
USE COPPER ASBESTOS GASKET AS PATTERN
CYLINDER HEAD
COAT SPACE GASKET LIBERALLY ON EACH SIDE AND INSERT UNDER CYLINDER HEAD

Lowering the compression pressure to overcome fuel knock



Wrench for crankcase and flange bolts

Increasing the Engine's Explosion Space

The unaccountable pounding or knocking in engines made some few years back and also evident in engines in heavy closed cars, can be overcome by raising the cylinder head slightly, thereby reducing the compression somewhat. This knocking is attributed to the heavier grades of fuel being sold, but whatever the exact nature of the ailment may be the reduced compression overcomes it and the work is not difficult.

Procure a piece of fiber or wall board and cut a gasket from this, using the copper asbestos gasket as a pattern.

Coat each side of this spacing gasket with graphite grease and place it under the cylinder head. Material one-eighth to three-sixteenths of an inch in thickness will usually be found to reduce the compression sufficiently, depending, of course, upon the piston diameter.

Wrench for Crankcase and Flange Bolts

A time saving attachment for the socket wrench that makes the removal of crankcase bolts a one man job is shown in the sketch.

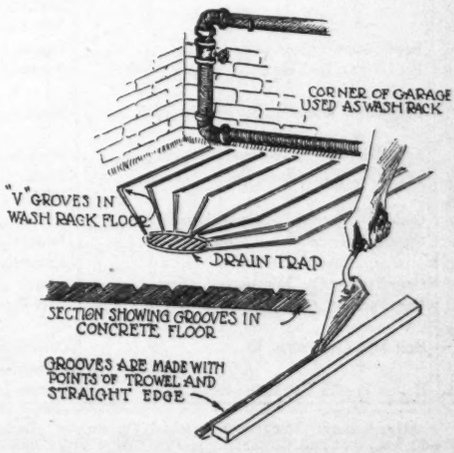
This fixture consists of a strip of sheet steel punched with a hexagonal opening at one end. This opening is to fit the head of the bolt. The opposite end is a drilled hole the size of the socket wrench bar. A valve spring or similar spring and a washer complete the attachment.

The method of using this wrench is to press down the added fixture with the socket over the nut, until the hexagonal opening slips over the head of the bolt. The spring will hold it in place. The sheet steel part is prevented from turning by the crankcase or flange.

With the cranked handle type of socket wrench, a bolt and nut can either be removed or replaced in one half the usual time.

Prolong the Life of Your Inner Tubes

Many motorists allow their rims to become badly rusted. The rough particles of rust and scale act like sandpaper on the inner tube and a prematurely worn tube or blow out is the result. An occasional coat of aluminum paint when the tires are removed will act as a rust preventative and greatly prolong the life of the tubes.


CORNER OF GARAGE USED AS WASH RACK
"V" GROVES IN WASH RACK FLOOR
DRAIN TRAP
SECTION SHOWING GROOVES IN CONCRETE FLOOR
GROOVES ARE MADE WITH POINTS OF TROWEL AND STRAIGHT EDGE

Grooving the concrete floor around the washrack to quickly carry the water away to the drain

Motor Age Monthly Guide to Tractors

Line Number	Manufacturer	Tractor and Model	Drawbar horsepower	Belt horsepower	Number plows recommended	Size separator recommended	Pounds pull drawbar	Weight	Price	Traction	Diameter drive wheels	Make of engine	No. and type of cylinder	Bore and stroke	Normal R. P. M.
1		Oil Pull	12	20	3	22 x 36	2150	6682	.....	Wh.	51	Own	2 Hor.	6 x 8	560
2	Advance-Rumely Thresher Co., Laporte, Ind.	Oil Pull	16	30	4	28 x 44	2850	9600	.....	Wh.	56	Own	2 Hor.	7 x 8½	530
3		Oil Pull	20	40	5-6	32 x 52	3750	12820	.....	Wh.	64	Own	2 Hor.	8 x 10	450
4		Oil Pull	30	60	8-10	36 x 60	5900	26700	.....	Wh.	80	Own	2 Hor.	10 x 12	375
5	Allis-Chalmers Mfg. Co., Milwaukee, Wis.	Allis-Chalmers, 18-30	18	30	4	.....	3000	6000	$1,885	Wh.	50	Own	4 Ver.	4¾ x 6½	830
6	Appleton Mfg. Co., Batavia, Ill.	Appleton	12	20	2-3	22	2000	4900	1,500	Wh.	54	Buda	4 Ver.	4¼ x 5½	1050
7	Aultman-Taylor Machinery Co., Mansfield, O.	Aultman Taylor	15	30	4	28	2800	7500	2,300	Wh.	70	Clim.	.....	5 x 6½	900
8												Wauk.	4 Ver.	4¾ x 6¾	
9		Aultman-Taylor	22	45	6	32	4800	13000	3,700	Wh.	70	Own	4 Hor.	5⅛ x 8	600
10		Aultman-Taylor	30	60	8-12	.....	8000	23000	4,800	Wh.	90	Own	4 Hor.	7 x 9	500
11	Automotive Corp., Toledo, Ohio	Automotive, B-3	12	24	2	26	2000	.....	3,400	Wh.	40	Herc.	4 Ver.	4 x 5⅛	1000
12															
13															
14		Avery, 8-16	8	16	2-3	22 x 32	1800	4900	.....	Wh.	50	Own	2 Hor.	5½ x 6	600-750
15															
16		Avery, 12-25	12	25	3-4	20 x 30	2800	7500	.....	Wh.	56	Own	2 Hor.	6½ x 7	600-700
17		Avery, 14-28	14	28	3-4	24 x 36	3000	6800	.....	Wh.	60	Own	4 Hor.	4⅝ x 7	700-900
18	Avery Co., Peoria, Ill.	Avery, 18-36	18	36	4-5	24 x 36	3500	9250	.....	Wh.	65	Own	4 Hor.	5½ x 6	650-750
19						28 x 46									
20		Avery, 25-50	25	50	5-6	28 x 46	4800	12500	.....	Wh.	69	Own	4 Hor.	6½ x 7	600-700
21						32 x 54									
22		Avery, 40-80	40	80	8-10	36 x 60	7600	22000	.....	Wh.	87½	Own	4 Hor.	7¾ x 8	500-600
23	Bates Mach. & Trac. Co., Joliet, Ill.	Steel Mule	15	22	3	26 x 36	.....	4600	.....	Cr.	.....	Erd	4 Ver.	4¼ x 6	900
24															
25		Tracklayer, B	12	25	3	.....	2000	5100	2,600	Cr.	.....	Own	4 Ver.	4⅝ x 5¼	850
26	C. L. Best Gas Trac. Co., San Leandro, Calif.														
27		Tracklayer, A	35	60	9	.....	6500	17500	5,750	Cr.	.....	Own	4 Ver.	6½ x 3½	650
28															
29	Boring Tractor Corp., Rockford, Ill.	Boring	..	24	2-16	24 x 36	.....	3600	1,595	Wh.	54	Wauk.	4 Ver.	4⅜ x 5¼	1000
30	Buckeye Mfg. Co., Anderson, Ind.	Trundaar, 10	25	40	4	.....	3750	8800	3,750	Ch. T.	.....	Wauk.	4 Ver.	5 x 6¼	900
31	Bull Tractor Co., Anderson, Ind.	Bull	12	24	2-3	26	1000	4996	1,200	.....	60	Toro	2 Hor.	5½ x 7	750
32	Burn-Oil Tractor Co., Peoria, Ill.	Burn-Oil	15	30	3-4	26	3000	5500	1,650	Wh.	56	Own	2 Hor.	6¾ x 7	700
33															
34	J. I. Case Plow Works Co., Racine, Wis.	Wallis, K	15	25	3	24 x 40	2600	3560	.....	Wh.	48	Own	4 Ver.	4¼ x 5¾	900
35		Case, 10-18	10	18	2-3	20 x 28	1665	3820	1,800	Wh.	42	Own	4 Ver.	3⅞ x 5	1050
36	J. I. Case T. M. Co., Racine, Wis.	Case, 15-27	15	27	3-4	26 x 46	2500	6460	1,800	Wh.	52	Own	4 Ver.	4½ x 6	900
37		Case, 22-40	22	40	5	32 x 54	3760	9700	2,850	Wh.	56	Own	4 Ver.	5½ x 6¾	850
38															
39	Cleveland Trac. Co., Cleveland, Ohio	Cletrac, W	12	20	2	24 x 40	1500	3400	1,395	Cr.	.....	Own	4 Ver.	4 x 5½	1265
40	Coleman Trac. Sales Co., Kansas City, Mo.	Coleman	16	30	3	28 x 48	3000	5200	1,850	.....	44	Clim.	4 Ver.	5 x 6½	750
41	Dart Truck & Trac. Corp., Waterloo, Ia.	Blue J	15	30	3-4	28	2500	4500	2,000	Wh.	42	Buda	4 Ver.	4½ x 6	1050
42		Sandusky J	10	20	3	22	2000	4080	1,650	Wh.	48	Own	4 Ver.	4¼ x 5¼	1050
43	Dauch Mfg. Co., Sandusky, Ohio.														
44		Sandusky, E	15	35	4	30	3500	7670	2,500	Wh.	56	Own	4 Ver.	5 x 6½	750
45		Leader, B	12	24	2	20	2000	5200	1,285	.....	48	Own	2 Hor.	6¼ x 6	800
46	Dayton-Dowd Co., Quincy, Ill.	Leader, N	16	32	3-4	28	3500	5800	1,985	Wh.	54	Clim.	4 Ver.	5 x 6½	800
47		Leader, C	18	36	3-4	28	4000	6500	2,495	Cr.	.....	Twin	4 Ver.	5 x 7½	750
48		Leader, D	20	40	4-5	28	5000	6500	2,750	Cr.	.....	Doman	4 Ver.	6 x 7	750
49	Dill Trac. Mfg. Co., Little Rock, Ark.	Dill	20	....	3	.....	.....	4400	2,480	Wh.	42	Cont.	4 Ver.	4½ x 5½	900
50	Dubuque Trac. & Tr. Mfg. Co., Dubuque, Ia.	Klumb, F	16	32	3	28	3200	5250	.....	Wh.	45	Clim.	4 Ver.	5 x 6½	800
51	Eagle Mfg. Co., Appleton, Wis.	Eagle, F	12	22	2-3	24	2400	5850	1,390	Wh.	48	Own	2 Hor.	7 x 8	450
52		Eagle, F	16	30	3-4	28 x 30	3200	7100	1,850	Wh.	52	Own	2 Hor.	8 x 8	450
53	Electric Wheel Co., Quincy, Ill.	Allwork, C	14	28	3	28	3000	5000	.....	Wh.	48	Own	4 Ver.	5 x 6	800
54		E-B, Q	12	20	3	24	2000	6500	.....	Wh.	60	Own	4 Ver.	4¾ x 5	850
55	Emerson, Brantingham Co., Rockford, Ill.	E-B, 12-20, AA	12	20	3	24	2600	4355	.....	Wh.	54	Own	4 Ver.	4¾ x 5	900
56		E-B, 20-35	20	35	5	28	3300	9700	.....	Wh.	72	Own	4 Ver.	5¼ x 7	750
57		E-B, Reeves	40	65	8-10	44	10000	22750	.....	Wh.	90	Spec.	4 Ver.	7¼ x 9	500
58	Fageol Motors Co., Oakland, Calif.	Fageol, D	9	12	2	.....	1450	3500	1,525	.....	48	Lyc.	4 Ver.	3½ x 5	1250
59	Ford & Son, Inc., Henry, Dearborn, Mich.	Fordson	....	20	2	20 x 34	1800	2700	850	Wh.	42	Own	4 Ver.	4 x 5	1000
60															
61	Four-Drive Trac. Co., Big Rapids, Mich.	Fitch, 4	20	35	3-4	28 x 30	3200	6000	3,300	Wh.	F-36x12 R-42x12	Clim.	4. Ver.	5 x 6½	850
62															
63	Franklin Trac. Co., Greenville, Ind.	Franklin Flexible, B	15	30	2-3	22 x 36	2500	3500	1,695	Cr.	None	Erd.	4 Ver.	4¼ x 6	1000
64	Frick Co., Waynesboro, Pa.	Frick	12	24	3	22 x 26	.....	5800	.....	Wh.	60	Erd.	4 Ver.	4 x 6	900-1000
65		Frick	15	30	3-4	26	.....	6000	.....	Wh.	60	Beav.	4 Ver.	4¾ x 6	900-1000
66	General Ordnance Co., Cedar Rapids, Ia.	G-O	14	28	3	30	.....	4200	1,485	Wh.	46	Wauk.	4 Ver.	4½ x 5¾	1000
67	General Tractors, Inc., Chicago.	Monarch	9	16	2	.....	.....	4000	1,650	Cr.	.....	Own	4 Ver.	4 x 4	1000
68		Monarch	18	30	4	28	3300	8000	2,700	Cr.	.....	Beav.	4 Ver.	4¾ x 6	900
69	Gray Tractor Co., Minneapolis, Minn.	Gray	18	36	4	.....	2700	6185	.....	.....	54	Wauk.	4 Ver.	4¾ x 6¾	850
70	Hart-Parr Co., Charles City, Ia.	Hart-Parr, 30	....	30	3	28	3000	5570	1,395	Wh.	52	Own	2 Hor.	6½ x 7	750
71															
72	Holt Mfg. Co., Peoria, Ill.	Caterpillar, 5-Ton	25	40	4	32 x 52	3100	9400	.....	Cr.	.....	Own	4 Ver.	4¾ x 6	1050
73		Caterpillar, 10-Ton	40	60	5	40 x 60	5000	18800	.....	Cr.	.....	Own	4 Ver.	6½ x 7	700
74	Holton Tractor Co., Indianapolis, Ind.	Holton, 2-A	10	16	2-12	.....	.....	2500	1,250	Wh.	42	Le Roi	4 Ver.	3⅛ x 4½	1250

Abbreviations: **Traction**—Wh., wheel; Cr., crawler. **Engine**—Beav., Beaver; Veer., Veerac; Herc., Hercules; Wauk., Waukesha; Buff., Buffalo; Asso., Associated Manufacturers; Auto., Automatic; Weid., Weidely; Clim., Climax; Twin, Twin City; Cont., Continental; Ruten, Rutenber; Over., Overland; Kenn., Kenneth. **Cylinders**—Ver., Vertical; Hor., horizontal; Opp., opposed. **Fuel**—G, gasoline; K, kerosene; D, distillate. **Carburetor**—Ray., Rayfield; King, Kingston; Holl., Holley; Scheb., Schebler; Ben., Bennett; Web., Webster; Zeph., Zephyr; Ens., Ensign; Strom., Stromberg; Till., Tillotson; Zen., Zenith; Car., Carter. **Air-Cleaner**—Donal., Donaldson; Ben., Bennett; Hol., Holley. **Magneto**—A-K., Atwater-Kent; Sum., Sumter; Eise., Eiseman; Berl., Berling. **Clutch**—B. & B., Borg & Beck; Bier., Bierman; Mun., Muncie; Rock., Rockwood; spec., special. **Gearset**—B. & S., Brown & Sharpe; Nutt., Nuttall. **Gearset type**—Sl. G., sliding gear; Sel. G., selective gear; Fr., friction; Plan., planetary; Sl. J. C., sliding jaw clutch. **Final Drive**—S. G., spur gear; Ch., chain; D. R., double reduction; B. G., bull gear. **Drive**—Op., open; In., inclosed.

and Their Technical Specifications

Line No.	Fuel	Make and size of carburetor	Make of air cleaner	Make of magneto	Make of clutch	Make of gearset	Type of gearset	Make of radiator	Make of bearings in transmission	Make of bearings in front axle	Make of bearings in rear axle	Belt pulley diameter	Belt pulley R. P. M.	Belt Speed F. P. M.	Speeds forward	Speed range M. P. H.	Recommended plowing speed	Final Drive	Drive	Furrow wheel	Line No.
1	K-D	2¼-Own	Donal.	Bosch	Own	Own	Sl. G.	Own	Own	Hyatt	Hyatt	19	560	2790	2	2.1-3.26	2.1	S. G.	Op.	No.	1
2	K-D	2½-Own	Donal.	Bosch	Own	Own	Sl. G.	Own	Own	Hyatt	Hyatt	23	530	3190	2	2.1-3	2.1	S. G.	Op.	No.	2
3	K-D	2¾-Own	Donal.	Bosch	Own	Own	Sl. G.	Own	Own	Hyatt	Hyatt	26	450	3060	2	2-3.2	2	S. G.	Op.	No.	3
4	K-D	3¼-Own	None	Bosch	Own	Own	Sl. G	Own	Own	Own	Own	36	375	3540	1	1.9	1.9	S. G.	Op.	No.	4
5	G-K	1½-King	Ben.	Opt.	Own	Own	Sl. G.	Own	Hyatt	Own	Hyatt	15	830	3200	2	2.3-2.8	2.8	.....	In.	Yes	5
6	G-K	1¼-Scheb.	Ben.	Bosch	B. & B.	Nutt	Sl. G.	Perfex	Hyatt	Own	Hyatt	7½	825	2600	2	2¼-3½	.....	I. G.	.....	Yes	6
7	G-K-D	1⅜-King	Ben.	Eise.	Own	Own	Sl. G.	Hooven	Hyatt	Own	Hyatt	20	450	2400	1	2.2-2.49	2.5	I. G.	.....	Yes	7
8																					8
9	G-K-D	2 -King	.....	Eise.	Own	Own	Sl. G.	Own	Own	Own	Own	20	600	3150	.....	1-2.93	2.13	B. G.	.....	No	9
10	G-K-D	2½-King	.....	Eise.	Own	Own	.....	Own	Own	Own	Own	24	500	3150	2.2	1-2.2	2.2	B. G.	.....	No	10
11	G-K	1¼-King.	Ben.	Eise.	B. & B.	Own	Sl. G.	McCord	U. S. Gurney Hyatt	Timk.	Timk.	10	996	2600	2	2¼-4	2¼	I. G.	In.	Yes	11
12																					12
13																					13
14	G-K	1¼-King.	.....	K-W	Own	Own	C. M.	Own	.....	Own	Own	17½	600	2750	2	1¾-3	1¾	S. G.	Op.	.....	14
15	D-A																				15
16	G-K-D	1½-King.	.....	K-W	Own	Own	C. M.	Own	.....	Own	Own	19½	600	2910	2	1¾-2¾	1¾	S. G.	Op.	.....	16
17	G-K-D	1¼-King.	.....	K-W	Own	Own	C. M.	Own	.....	.....	Own	16	700	2930	2	2½-3½	2	S. G.	Op.	.....	17
18	G-K-D	1½-King.	.....	K-W	Own	Own	C. M.	Own	.....	Own	Own	18	650	3065	2	2-3	2	S. G.	Op.	.....	18
19																					19
20	G-K-D	2-King.	.....	K-W	Own	Own	C. M.	Own	.....	Own	Own	22	600	2880	2	2-3	2	S. G.	Op.	.....	20
21																					21
22	G-K-D	2-King.	.....	K-W	Own	Own	C. M.	Own	.....	Own	Own	26	500	3400	2	1¾-2⅝	1¾	S. G.	Op.	.....	22
23	G-K-D	1¼-Ben.	Ben.	Dixie	B. & B.	Own	Sl. G.	Modine	Timk.	Timk.	T. & H.	12	725	2300	2	2.33-3.5	2.33	S. G.	.....	.....	23
24																					24
25	D	1½-Ens.	Ben.	Split.	Own	Own	Sl. G.	Own	Hyatt Timk.	.....	Hyatt	9	9000	1971	2	2¼-3	3	I. G.	.....	.....	25
26																					26
27	D	2-Ens.	Ben.	Bosch	Own	Own	Sl. G.	Own	Hyatt Timk.	.....	Timk.	16	650	2720	2	3-2	3	I. G.	.....	.....	27
28																					28
29	G-K	1¼-King.	Ben.	King.	Twin	Own	Sl. G.	Perfex.	Hyatt	Hyatt	Hyatt	.....	421	.....	2	2-3	2⅜	Ch.	In.	Yes	29
30	G-K-D	-Strom.	Own	Bosch	Hill.	Own	Sl. G.	Modine	Opt.	.....	H. & T.	.....	900	2600	2	1.3-2.5	.....	S. G.	In.	.....	30
31	G-K-D	1½-King.	Donald.	K-W	.....	.....	.....	.....	.....	.....	Hyatt	12	750	.....	1	2.4-2¾	2.4	B. G.	.....	.....	31
32	K	1½-Scheb.	Ben.	K-W	Own	Own	Sl. G.	Eureka	S.K.F. Hyatt	Own	Own	13	700	2600	2	2-3	3	I. G.	In.	Yes	32
33																					33
34	G-K-D	1¼-Ben.	Ben.	Berl.	Twin	Own	Sl. G.	Modine	Timk.	Hyatt	Timk.	18	430	.....	2	1½-3½	2½-3½	S. G.	.....	.....	34
35	K	1½-King.	Own	King.	Own	Own	Sl. G.	Own	Hyatt	Own	Hyatt	14¼	1050	3731	2	2¼-3½	2¼	S. G.	In.	No	35
36	K	1⅜-King.	Own	Bosch	Own	Own	Sl. G.	Own	Hyatt	Own	Hyatt	16	900	3762	2	2¼	2¼	S. G.	In.	No	36
37	K	2-King.	Own	Bosch	Own	Own	Sl. G.	Own	Hyatt Timk.	Timk.	Hyatt	16½	850	3669	2	1.2-3.2	2.2	S. G.	In.	No	37
38																					38
39	G-K-D	1⅜-King.	Own	Teagle	Own	Own	Sl. G.	McCord	.....	Timk.	Timk.	8	1265	2500	1	1-3½	3	I. G.	In.	.....	39
40	G-K	1½-Ben.	Ben.	Dixie	Own	Own	Sl. G.	Own	Opt.	Own	Own	14	750	2750	2	2-3	3	Worm	.....	.....	40
41	G	1¼-King.	R. W.	Split.	Delt.	Own	Sel.	Own	Gurney	Timk.	Timk.	12	710	2600	3	1¼-6	2½	D. R.	In.	Yes	41
42	G-K-D	1¼-King.	Ben.	Dixie	Own	Own	Sel.	Perfex	Hyatt N. D.	Own	Own	10	1000	2600	2	2-3	2	I. G.	.....	Yes	42
43																					43
44	G-K-D	2 -King.	Ben.	Dixie	Own	Own	Sel.	C. & P.	Own	Own	Own	15	800	2950	3	2-5½	2	I. G.	Op.	No	44
45	K	1½-King.	Own	King.	Own	Own	Sel.	Eureka	Own	Own	Own	14	800	2800	2	2¼-3½	2¼	I. G.	Op.	.....	45
46	K	1½-Strom.	Ben.	Eise.	B.&B	Own	Sel.	Own	Opt.	Hyatt	Hyatt	14	800	2900	.....	.....	3½	I. G.	In.	.....	46
47	K-D	1¾-King.	Ben.	K-W	Own	Own	Sel.	Eureka	Own	Own	Own	14	750	2700	2	1.8-2½	1.8	Ch.	Op.	.....	47
48	G-K-D	1½-Holl.	Ben.	Dixie	Own	Own	Sel.	Eureka	Own	Own	Own	14	750	2700	2	1.8-2½	1.8	Ch.	Op.	.....	48
49	G	1½-King.	Donald	Bosch	B.&B.	Cotta	Sl. G.	Eureka	S.K.F.	Hyatt	Hyatt	.....	.....	.....	3	1-5	3	Ch.	.....	.....	49
50	K	1½-Strom.	Ben.	Dixie	Own	Own	C. M.	Hooven	Hyatt	Hyatt	Hyatt	14	800	2600	2	2½-4	2½	.....	In.	.....	50
51	G-K	.....	Own	Dixie	Own	Own	Sl. G.	Perfex	Hyatt	Own	Own	20	450	2350	2-3	1½	2	G.	.....	Yes	51
52	G-K	.....	Own.	Dixie	Own	Own	Sl. G.	Perfex	Hyatt	Own	Own	24	450	2827	2-3	1½	2	G.	.....	Yes	52
53	K	1½-King.	Ben.	King.	Own	Own	Sl. G.	Perfex	Hyatt	.....	.....	13½	800	2500	3	1⅞-3¾	2½	B. G.	.....	.....	53
54	K	1½-Ben.	Ben.	K-W	Own	Own	Sl. G.	Perfex	Own	Own	Own	12	800	2225	3	1⅞-3.64	.....	B. G.	Op.	Yes	54
55	K	1½-Strom.	Ben.	K-W	Own	Own	Sl. G.	Perfex	Hyatt	.....	.....	12	900	2800	2	2.01-2.78	2.78	I. G.	In.	No	55
56	K	1½-Ben.	Ben.	K-W	Own	Own	Sl. G.	Modine	Hyatt	Own	Hyatt	16	597	2500	2	1.81-2.33	2.33	G.	Op.	No	56
57	K	2½-King.	Ben.	K-W	Own	Own	Sl. G.	Perfex	Hyatt	Own	Hyatt	22	500	2880	1	2	.....	G.	Op.	.....	57
58	G-K-D	1 -Zen.	Own	Dixie	Own	Own	C. M.	Modine	Timk.	Timk.	Timk.	8	1250	2600	1	¾-3	2⅛	S. G.	.....	.....	58
59	K	-Holl.	Own	Own	Own	Own	Sel.	Own	Gurney S. R. B.	Timk.	Gurney S. R. B	9½	1000	2480	3	1-8	2¾	Worm	In.	.....	59
60																					60
61	K	1½-King.	Ben.	Dixie	B.&B.	Cotta	Ind. Cl.	Spirex	Timk.	Timk.	Timk.	14	650	2275	3	¾-4	2½	F. Bevel R. Worm	.....	No	61
62																					62
63	G-K	1¼-King.	Ben.	Eise.	B.&B.	Own	St. G.	McCord	N. D.	Timk.	Timk.	10	1000	2618	3	2-3-4	3	B. G.	In.	None	63
64	K	-King.	Ben.	King.	Own	Nutt.	S.	Perfex	Hyatt	Own	Own	13	900	3060	2	2.3-3.8	2½	S. G.	.....	Yes	64
65	K	-Ben.	Ben.	Dixie	Own	Nutt.	S.	Perfex	Hyatt	Own	Own	13	900	3060	2	2.3-3.8	2½	S. G.	.....	Yes	65
66	G-K	1¼-King.	Ben.	Eise.	.....	Own	C. M.	Perfex	S. K. F.	.....	.....	10	970	.....	6	1¾-3	2½	S. G.	In.	No	66
67	G-K-D	1-King.	Ben.	K-W	M.&E.	Own	Sl. G.	Perfex	.....	.....	.....	19¾	1000	2600	3	1½-3½	2¼	G.	.....	.....	67
68	G-K-D	1½-King.	Ben.	K-W	M.&E.	Own	Sl. G.	Perfex	.....	.....	.....	16	600	2600	3	1½-3½	2¼	Ch.	.....	.....	68
69	G-K	1½-Ben.	Ben.	Bosch	Own	Own	.....	S-J	Hyatt	.....	Hyatt	11⅜	850	2900	2	2½	2¾	Ch.	In.	Yes	69
70	K	K-Shunt	Own	K-W	Own	Own	Sl. G.	S-J	S.K.F. Hyatt	Own	.....	14	750	2750	2	2-3	3	I. G.	Op.	Yes	70
71																					71
72	G	1½-Scheb.	Donald	Eise.	Own	Own	Sl. G.	Modine	Hyatt	Hyatt	Hyatt	12	1012	3150	3	1.5-5.7	3	G.	In.	No	72
73	G	2 -King.	Donald	K-W	Own	Own	Sl. G.	Own	Hyatt	Hyatt	Hyatt	14	850	3120	3	1.65-4.78	3	G.	In.	No	73
74	G	⅜-King.	Ben.	Eise.	Detl.	Covert	Sl. G.	Perfex	.....	.....	.....	6	1250	1963	3	¾-4	2¼	I. G.	.....	Yes	74

Abbreviations: **Traction**—Wh., wheel; Cr., crawler. **Engine**—Beav., Beaver; Veer., Vecrac; Herc., Hercules; Wauk., Waukesha; Buff., Buffalo; Asso., Associated Manufacturers; Auto., Automatic; Weid., Weidely; Clim., Climax; Twin, Twin City; Cont., Continental; Ruten, Rutenber; Over., Overland; Kenn., Kenneth. **Cylinders**—Ver., Vertical; Hor., horizontal; Opp., opposed. **Fuel**—G, gasoline; K, kerosene; D, distillate. **Carburetor**—Ray., Rayfield; King, Kingston; Holl., Holley; Scheb., Schebler; Ben., Bennett; Web., Webster; Zeph., Zephyr; Ens., Ensign; Strom., Stromberg; Till., Tillotson; Zen., Zenith; Car., Carter. **Air-Cleaner**—Donal., Donaldson; Ben., Bennett; Hol., Holley. **Magneto**—A-K., Atwater-Kent; Sum., Sumter; Eise., Eiseman; Berl., Berling. **Clutch**—B. & B., Borg & Beck; Bier., Bierman; Mun., Muncie; Rock., Rockwood; spec., special. **Gearset**—B. & S., Brown & Sharpe; Nutt., Nuttall. **Gearset type**—Sl. G., sliding gear; Sel. G., selective gear; Fr., friction; Plan., planetary Sl. J. C., sliding jaw clutch. **Final Drive**—S. G., spur gear; Ch., chain; D. R., double reduction; B. G., bull gear. **Drive**—Op., open; In., inclosed.

Motor Age Monthly Guide to Tractors

Line Number	Manufacturer	Tractor and Model	Drawbar horsepower	Belt horsepower	Number plows recommended	Size separator recommended	Pounds pull drawbar	Weight	Price	Traction	Diameter drive wheels	Make of engine	No. and type of cylinder	Bore and stroke	Normal R. P. M.
75	Huber Mfg. Co., Marion, Ohio	Huber, 12-25	12	25	3	24 x 42	2400	5000	.....	Wh.	60	Wauk.	4 Ver.	4½x5¾	1000
76	Illinois Tractor Co., Bloomington, Ill.	Illinois, C	18	30	4	24 x 28	3500	5200	2,375	Wh.	54	Clim.	4 Ver.	5 x6½	800
77		International	8	16	2	.....	1350	3600	.....	Wh.	40	Own	4 Ver.	4¼x5	1000
78	International Harvester Co., Chicago	Titan	10	20	3	.....	1800	5710	.....	Wh.	54	Own	2 Hor.	6½x8	575
79		International	15	30	4	.....	2500	8990	.....	Wh.	66	Own	4 Hor.	5¼x8	575
80	J. T. Tractor Co., Cleveland, Ohio	J. T., N	16	40	3	30	3200	7000	2,800	Wh.	48	Chief	4 Ver.	4¾x6	1000
81	Kardell Trac. & Tr. Co., St. Louis, Mo.	Kardell Utility	10	20	2	1700	.....	3500	1,350	.....	.....	Wis.	4 Ver.	4 x5	1200
82	Keck Gonnerman Co., Mt. Vernon, Ind.	Keck-Gonnerman, B	12	24	3	24 x 40	2500	6500	1,500	Wh.	60	Own	2 Hor.	7½x8	700
83		Flour City, Jr.	14	24	3	24	.....	.....	.....	.....	60	Own	4 Ver.	5 x5	800
84	Kinnard & Sons Mfg., Co. Minneapolis, Minn.	Flour City	20	35	4-5	28	.....	10000	.....	.....	72	Own	4 Ver.	5¼x6	800
85		Flour City	30	50	6-8	30	.....	14000	.....	.....	84	Own	4 Ver.	6¼x7	550-600
86		Flour City	40	70	8-10	36	.....	21000	.....	.....	96	Own	4 Ver.	7½x9	450-500
87	La Crosse Trac. Co., La Crosse, Wis.	La Crosse, G	12	24	3	24	2000	4000	945	Wh.	56	Own	2 Hor.	6 x7	900
88	Lauson, John Mfg., Co., New Holstein, Wis.	Full Jewel	15	30	3-4	24 x 30	3000	6500	2,150	Wh.	54	Beav.	4 Ver.	4¾x6	950
89	Liberty Tractor Co., Minneapolis, Minn.	Liberty	18	32	4	30	3380	5900	2,475	Wh.	48	Clim.	4 Ver.	5 x6½	850
90	Magnet Tractor Co., Minneapolis, Minn.	Magnet, B-14-28	14	28	3	24	2600	4500	1,850	Wh.	48	Wauk.	4 Ver.	4½x6¼	900
91		Twin City, 12-20	12	20	3	20 x 24	2000	4200	.....	Wh.	50	Own	4 Ver.	4½x6	1000
92		Twin City, 16-30	16	30	4	24 x 28	3000	7800	.....	Wh.	54	Own	4 Ver.	5 x7½	650
93	Minneapolis Steel & Machinery Co., Minneapolis,	Twin City, 25-45	25	45	6	32 x 34	6700	16000	.....	Wh.	76	Own	4 Ver.	6¼x8	600
94	Minn.	Twin City, 40-65	40	65	8	40	7500	23700	.....	Wh.	84	Own	4 Ver.	7¼x9	535
95		Twin City, 60-90	60	90	12	40	11250	2800	.....	Wh.	84	Own	6 Ver.	7¼x9	535
96	Mobile Tractor Co., Mobile, Ala.	Mobile	12	24	.....	.....	.....	3200	1,450	.....	.....	Herc.	.....	4¼x5½	.....
97	Moline Plow Co., Moline, Ill.	Universal D	9	18	2	24	2000	3380	1,500	Wh.	52	Own	4 Ver.	3½x5	1650
98		Oil-Gas, 18-36	18	36	4	30 x 46	.....	13500	.....	Wh.	64	Own	2 Hor.	8 x10	400-450
99	Nichols & Shepard Co., Battle Creek, Mich.	Oil-Gas, 25-50	25	50	6	32 x 52	.....	19000	.....	Wh.	69	Own	2 Hor.	9 x12	350-425
100		Oil-Gas, 35-70	35	70	8-10	40 x 60	.....	30000	.....	Wh.	73	Own	2 Hor.	10½x14	300-375
101	Oliver Tractor Co., Knoxville, Tenn.	Oliver, A	15	30	.....	.....	.....	7700	.....	.....	.....	Beav.	4 Ver.	4½x6	.....
102	Parrett Tractor Co., Chicago Heights, Ill.	Parrett, H	12	25	3	.....	2800	5225	.....	Wh.	60	Buda	4 Ver.	4¼x5½	1000
103	Peoria Tractor Corp., Peoria, Ill.	Peoria, J	12	25	3	26	3000	5100	1,985	Wh.	56	Clim.	4 Ver.	5 x6½	800
104	Pioneer Tractor Co., Winona, Minn.	Pioneer, 18-36	18	36	4	28	4000	6100	.....	.....	60	Own	4 Hor.	5½x6	750
105		Pioneer, 30	30	60	10	36	8000	24000	.....	.....	96	Own	4 Hor.	7 x8	650
106	Plow Man Tractor Co. Waterloo, Ia.	Plow Man, 15-30	15	30	3-4	30	3000	5100	1,895	Wh.	60	Buda	4 Ver.	4½x6	1000
107	Pope Mfg. Co., Watertown, S. D.	Dakota, 4	15	27	3	24	2000	5700	1,750	Wh.	42	Doman	4 Ver.	4¾x6	800
108	Post Tractor Co., Cleveland	Post, D	12	20	2	.....	.....	4300	.....	Wh.	32	Wauk.	4 Ver.	4¼x5¾	800
109	Pt. Huron Eng. & T. Co., Pt. Huron, Mich.	Port Huron, 12-25	12	25	3	22 x 38	2250	5900	.....	Wh.	56	Chief	4 Ver.	4¾x6	900
110															
111	Reed Fdy. & Mach. Co., Kalamazoo, Mich.	One-Man	12	25	3	22 x 24	.....	5000	1,685	Wh.	60	Wauk.	4 Ver.	4½x5¾	1000
112	Rock Island Plow Co., Rock Island, Ill.	Heider, D	9	16	2	20	1500	4000	.....	Wh.	54	Wauk.	4 Ver.	4¼x5¾	1000
113															
114		Heider, C	12	20	2	24	2000	6000	.....	Wh.	57	Wauk.	4 Ver.	4½x6¾	900
115															
116		Russell Junior	12	24	2	18	2000	6200	.....	Wh.	53	Wauk.	4 Ver.	4½x5¾	1000
117	Russell & Co., Massillon, Ohio	Russell Little Boss	15	30	3	24	3000	6900	.....	Wh.	53	Wauk.	4 Ver.	4½x6¾	950
118		Russell Big Boss	20	35	4	30	4000	7600	.....	Wh.	60	Model	4 Ver.	5½x7	825
119		Russell Giant	30	60	8	40	6000	24000	.....	Wh.	84	Own	4 Ver.	8 x10	525
120	Samson Tractor Co., Janesville, Wis.	Samson, D	....	....	1	.....	.....	.....	630	Wh.	.....	.....	4 Ver.	.....	.....
121		Samson, M	....	....	2	20 x 32	.....	.....	840	Wh.	.....	.....	4 Ver.	.....	.....
122	Shaw Enochs Trac. Co., Minneapolis, Minn.	Shawnee	9	18	2	22	2100	3800	.....	Wh.	60	Gray	4 Ver.	3½x5	1200
123	Shelby Trac. & Tr. Co., Shelby, Ohio.	Shelby, C	9	18	2	22	.....	3500	.....	Wh.	42	Wauk.	4 Ver.	3¾x5¼	1000
124		Shelby, D	15	30	.....	.....	.....	4600	.....	Wh.	48	Spec.	.....	4¾x6	.....
125	Short Turn Tractor Co., Minneapolis, Minn.	Short Turn, D	20	40	3	24	.....	5000	1,500	Wh.	65	.....	4 Ver.	4¾x6	950
126															
127															
128	Square Turn Tractor Co., Norfolk, Nebr.	Square Turn, A	18	35	3	28	3200	7400	.....	.....	60	Clim.	4 Ver.	5 x6½	850
129	Stockton Tractor Co.,	Stockton, A	....	....	2	.....	.....	3150	.....	.....	.....	.....	4 Ver.	3½x5	.....
130	Stinson Trac. Co., Superior, Wis.	Stinson, 4-E	18	36	4	28 x 30	.....	7100	.....	Wh.	60	Beav.	4 Ver.	4¾x6	950
131	Tioga Mfg. Co., Philadelphia, Pa.	Tioga, 3	15	27	3-4	.....	.....	4950	.....	Wh.	36	Wis.	4 Ver.	4½x6	1000
132	Topp-Stewart Trac. Co., Clintonville, Wis.	Topp-Stewart, B	30	45	4-6	.....	7600	7500	3,500	Wh.	42	Wauk.	4 Ver.	4¾x6¾	900
133	Toro Motor Co., Minneapolis, Minn.	Toro	....	12	2-12	.....	1000	2300	.....	Wh.	42	Le Roi	4 Ver.	3⅛x4½	1200
134	Traylor Engrg. & Mfg. Co., Cornwells, Pa.	Traylor, 6-12	....	12	1	.....	.....	1700	750	Wh.	38	Le Roi	4 Ver.	3⅛x4½	900
135	Turner Mfg. Co., Pt. Washington, Wis.	Simplicity	14	25	3	24	2600	4300	1,695	Wh.	54	Buda	4 Ver.	4¼x5½	1000
136	U. S. Trac. & Machy. Co., Menasha, Wis.	Uncle Sam, B-19	20	30	3	28	3000	4250	.....	Wh.	50	Beav.	4 Ver.	4¾x6	900
137	Victory Tractor Co., Greensburg, Ind.	Victory, 9-18	9	18	2	20	1500	3300	1,385	Wh.	48	Gray	4 Ver.	3½x5	1000
138		Victory, 15-30	15	30	3	28	2500	3450	1,750	Wh.	48	Wauk.	4 Ver.	4¼x5¾	900
139	Vim Tractor Co., Schleisingerville, Wis.	Vim	10	20	2-3	20	1800	3200	1,650	Wh.	48	Wauk.	4 Ver.	3¾x5¼	1050
140	Waterloo Gasoline Eng. Co., Waterloo, Ia.	Waterloo Boy, N	12	25	3	.....	2000	5900	.....	Wh.	52	Own	2 Hor.	6½x7	750
141	Wetmore, H. A., Sioux City, Ia.	Wetmore	12	25	2	22	.....	2900	1,485	Wh.	46	Wauk.	4 Ver.	4 x5¾	960
142	Wisconsin Farm Trac. Co., Sauk City, Wis.	Wisconsin, E	16	30	3-4	28	3500	5440	.....	Wh.	52	Clim.	4 Ver.	5 x6½	800
143	Yuba Mfg. Co., Marysville, Calif.	Ball Thread	12	20	3	.....	3500	6750	2,945	Cr.	.....	Wauk.	4 Ver.	4½x6¾	700
144		Ball Thread	20	35	5-6	.....	6000	10100	4,655	Cr.	.....	Wis.	4 Ver.	5¾x7	700

One and Two-Horse Tractors

145	Allis Chalmers Mfg. Co., Milwaukee, Wis.	General Purpose	6	12	1-16	.....	1000	2500	795	Wh.	48	Le Roi	4 Ver.	3⅛x4½	1000
146	Atlantic Mch. Mfg. Co., Cleveland, Ohio.	Merry Garden	....	2	.....	.....	.....	250	195	.....	20	.....	1 Ver.	2⅝x2½	900
147	Avery Co., Peoria, Ill.	Avery, 5-10 B	5	10	2	22 x 32	800	2600	.....	Wh.	38	Own	4 Ver.	3 x4	1200
148		Avery, 6-cyl	7	12	.....	22 x 32	.....	3150	.....	Wh.	38	Own	6 Ver.	3 x4	1200
149	Beeman Tractor Co., Minneapolis, Minn.	Beeman G	2	4	1-7	.....	260	550	310	Wh.	25	Own	1 Ver.	3½x4½	850
150	Consolidated G. & Gas. Eng. Co., New York.	Do-It-All	3	6	1	.....	.....	1000	495	.....	24	Own	1 Ver.	4½x5	900

Abbreviations: **Traction**—Wh., wheel; Cr., crawler. **Engine**—Beav., Beaver; Veer., Veerac; Herc., Hercules; Wauk., Waukesha; Buff., Buffalo; Asso., Associated Manufacturers; Auto., Automatic Weid., Weidely; Clim., Climax; Twin, Twin City; Cont., Continental; Ruten, Rutenber; Over., Overland; Kenn., Kenneth. **Cylinders**—Ver., Vertical; Hor., horizontal; Opp., opposed. **Fuel**—G, gasoline; K, keros ne; D, distillate. **Carburetor**—Ray., Rayfield; King, Kingston; Holl., Holley; Scheb., Schebler; Ben., Bennett; Web., Webster; Zeph., Zephyr; Ens., Ensign; Strom., Stromberg; Till., Tillotson; Zen., Zen.h; Car., Carter. **Air-Cleaner**—Donal., Donaldson; Ben., Bennett; Hol., Holley. **Magneto**—A-K., Atwater-Kent; Sum., Sumter; Eise., Eiseman; Berl., Berling. **Clutch**—B. & B., Borg & Beck; Bier., Bierman; Mun., Muncie; Rock., Rockwood; spec., special. **Gearset**—B. & S., Brown & Sharpe; Nutt., Nuttall. **Gearset type**—Sl. G., sliding gear; Sel. G., selective gear; Fr., friction; Plan., planetary; Sl. J. C., sliding jaw clutch. **Final Drive**—S. G., spur gear; Ch., chain; D. R., double reduction; B. G., bull gear. **Drive**—Op., open; In., inclosed.

and Their Technical Specifications

Line No.	Fuel	Make and size of carburetor	Make of air cleaner	Make of magneto	Make of clutch	Make of gearset	Type of gearset	Make of radiator	Make of bearings in transmission	Make of bearings in front axle	Make of bearings in rear axle	Belt pulley diameter	Belt pulley R. P. M.	Belt Speed F. P. M.	Speeds forward	Speed range M. P. H.	Recommended plowing speed	Final Drive	Drive	Furrow wheel	Line No.
75	G-K	¼-King.	Ben.	King.	Own	Own	Sel.	Perfex	G. & H.	Own	Own	13	1000	.....	2	2.43-3.75	2.43	S. G.	Op.	Yes	75
76	K	1⅛-Strom.	Ben.	Dixie	Twin	Foote	Sl. G.	Modine	Hyatt	Hyatt	Hyatt	14	600	2400	2	2½-3.4	2½	S. G.	In.	Yes	76
77	G-K-D	-Ens.	.....	Dixie	Own	.....	Sl. G.	B. & L.	Own	Own	.....	12¼	625	.....	.....	1¾-4.1	2⅝	Ch.	.....	.....	77
78	G-K-D	-Own	.....	K-W	Own	.....	Sl. G.	.....	Own	Own	.....	18	575	.....	.....	2¼-2⅞	2⅞	Ch.	.....	.....	78
79	G-K-D	-Own	.....	K-W	Own	.....	Sl. G	.....	Own	Own	.....	18	575	.....	.....	2¼-2⅞	2⅞	Ch.	.....	.....	79
80	K	1½-Own	Ben.	K-W	Own	Covert	Sel.	McCord	Timk.	Hyatt	Hyatt	10	1000	2600	3	1¼-5	2½	I. G.	In.	No	80
81	G	1 -Carter	Ben.	Dixie	Delt.	Own	Sel.	Eureka	Hyatt	Timk.	Gurney	10	1200	3100	2	2¼-4	3	S. G.	In.	Yes	81
82	K	-Scheb.	Ben.	Bosch	Own	Own	Sl. G.	Own	.....	.....	.....	11½	700	.....	3	2½-3½	3	S. G.	.....	.....	82
83	G-K	1½-Scheb.	.....	K-W	Own	Own	.....	Long	Hyatt	.....	.....	26	320	.....	2	2¾-3¼	2¼	G.	.....	.....	83
84	G-K	1½-Scheb.	.....	K-W	Own	.....	Sel.	Long	.....	.....	.....	26	350	.....	2	2¼-3	2¼	G.	.....	.....	84
85	G-K	2 -Scheb.	.....	K-W	Own	.....	.....	Long	.....	.....	.....	32	275	.....	1	.....	2½	G.	.....	.....	85
86	G-K	2½-Scheb.	.....	K-W	Own	.....	.....	Long	.....	.....	.....	34	275	.....	1	.....	2½	G.	.....	.....	86
87	K	1½-King.	Ben.	.....	Own	Own	.....	Long	Hyatt	Hyatt	Hyatt	7x11	750	2600	1	2-2¾	2½	.....	.....	Yes	87
88	K	1¼-King.	.....	Dixie	Own	Own	Sl. G.	Perfex	Hyatt	Timk.	Hyatt	18	475	2200	2	1½-2½	2½	G.	In.	.....	88
89	G-K	1½-Strom.	Ben.	Dixie	Bier.	Own	.....	S-J	Hyatt	Own	Own	12	900	2825	2	2½-5	2½	S. G.	In.	Yes	89
90	G-K	1½-Strom.	Ben.	Berl.	B. & B.	Own	Sl. G.	S-J	N. D.	N. D.	Opt.	14	700	2600	3	1¼-8	2¾	Worm	.....	Yes	90
91	G-K	1¼-Holl.	Ben.	Bosch	B. & B.	Own	Sl. G.	Modine	Hyatt	Own	Hyatt	16	650	2700	2	2.2-2.9	2.9	S. G.	In.	Yes	91
92	G-K	1½-Holl.	Ben.	K-W	Own	Own	Sl. G.	Modine	Hyatt	Own	Hyatt	17	528	2350	2	2-2.75	2¾	S. G.	In.	.....	92
93	G-K	2 -King.	.....	K-W	Own	Own	Sl. G.	Own	Own	Own	Own	20	600	3150	2	1.4-2	2	S. G.	Op.	.....	93
94	G-K	2½-King.	.....	K-W	Own	Own	Sl. G.	Own	Own	Own	Own	23	535	200	1	2	2	G.	Op.	.....	94
95	G-K	3 -King.	.....	K-W	Own	Own	Sl. G.	Own	Own	Own	Own	23	535	3200	1	2	2	S.	Op.	.....	95
96	.....	-King.	.....	Eise.	B. & B.	Spec.	.....	Own	Opt.	Opt.	Opt.	8x12	.....	.....	.....	.....	.....	.....	.....	.....	96
97	G	1½-Holl.	Ben.	Remy	B. & B.	Own	Sl. G.	Modine	Hyatt	.....	Hyatt	9	1230	2900	1	¾-3½	3½	G.	In.	Yes	97
98	K	-King.	.....	Dixie	Own	Own	Sl. G.	Perfex	Own	Own	Own	8x22	.....	.....	2	1½-3	1½-3	S. G.	.....	.....	98
99	K	2½-King.	.....	Wied.	Own	Own	Sl. G.	Perfex	Own	Own	Own	9x24	.....	.....	1	2.1	2.1	S. G.	.....	.....	99
100	K	3 -King.	.....	Wied.	Own	Own	Sl. G.	Perfex	Own	Own	Own	12x30	.....	.....	1	1.86	1.86	S. G.	.....	.....	100
101	G-K	-King.	Ben.	Dixie	.....	.....	Sl. G.	Modine	.....	.....	.....	21	.....	.....	2	1¾-2⅜	.....	.....	.....	.....	101
102	K	1¼-King.	Own	Eise.	Own	Own	Sl. G.	Perfex	.....	Hyatt	Hyatt	12	1000	3141	3	1.80-4	.....	I. G.	In.	.....	102
103	K	1½-Ben.	Ben.	Eise.	Own	Nutt.	Sl. G.	Eureka	Hyatt	.....	.....	14	650	2500	2	2½-4	2½	I. G.	.....	Yes	103
104	G-K	1½-King	Ben.	K-W	Own	Own	.....	S-J	Timk.	Timk.	Timk.	14	750	.....	3	1¾-4	2½	S. G.	.....	.....	104
105	G-K	2 -King.	Ben.	K-W	Own	Own	Sl. G.	S-J	Own	Own	Own	17½	650	.....	3	1¾-4¼	2½	.....	.....	.....	105
106	G-K	1¼-Strom.	Len.	Dixie	Twin	Foote	Sl. G.	Perfex	Hyatt	Hyatt	Hyatt	14	590	2200	2	2-3	.....	I. G.	Op.	.....	106
107	K	1¼-Linga	John.	K-W	Bier.	Own	Sl. G.	S-J	Own	Own	Own	14	800	2500	1	3	3	Ch.	.....	Yes	107
108	G-K	-King.	Ben.	Split.	Own	Own	.....	Perfex	Opt.	Timk.	Timk.	14	2500	.....	2	3-3	3	G.	.....	Yes	108
109	G-K	1⅜-King.	Own	Eise.	Own	Own	.....	Bremer	S. K. F.	Plain	Plain	14	650-1065	2380-3900	7	1⅞-4	2	S. G.	In.	Yes	109
110																					110
111	G-K	1¼-Ben.	Ben.	Dixie	Bier.	Own	Sl. G.	Modine	Hyatt	.....	Hyatt	14½	2600	703	2½-3½	.....	2½	B. G.	In.	Yes	111
112	G-K	1 -King.	Ben.	Dixie	Own	.....	Fr.	Perfex	U. S.	.....	Own	12	400-1000	2200	7	1-5	1¼	B. G.	Op.	Yes	112
113																					113
114	G-K	1¼-King.	Ben.	Dixie	Own	.....	Fr.	Perfex	U. S.	.....	Own	14	400-900	2200	7	1-5	2¼	B. G.	Op.	Yes	114
115																					115
116	K	1¼-King.	Ben.	Bosch	Own	Cotta	Sl. G.	.....	.....	.....	.....	12½	915	3000	3	1½-3¾	2¼	S. G.	Op.	.....	116
117	K	1¼-King.	Ben.	Dixie	Own	Cotta	Sl. G.	.....	.....	.....	.....	12½	810	2850	3	1½-3¾	2¼	S. G.	Op.	.....	117
118	K	1½-King.	Ben.	Dixie	Own	Own	Sl. G.	.....	.....	.....	.....	12½	840	2749	2	2.4-3¾	2.4	S. G.	Op.	.....	118
119	K	2 -King.	Ben.	Bosch	Own	Own	Sl. G.	.....	.....	.....	.....	24	525	3310	2	2-4½	2	S. G.	Op.	.....	119
120	G	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	120
121	G	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	18	375	.....	2	.....	.....	.....	.....	.....	121
122	G	1 -Scheb.	Ben.	Berl.	B. & B.	Own	Sl. G.	Todd	Fafnir	.....	Hyatt	8	.....	2600	2	2-3.1	3.1	.....	In.	Yes	122
123	G	1 -King.	Ben.	Dixie	Full.	Full.	Sl. G.	Modine	.....	Timk.	Timk.	10	850	2200	3	1¾-4¾	.....	I. G.	In.	.....	123
124	G-K	-King.	Ben.	.....	.....	Foote	Sl. G.	.....	.....	.....	.....	14	600	.....	2	27.4	.....	.....	.....	.....	124
125	G-K	1½-Opt.	Opt.	Dixie	.....	Own	Sel.	Splitex	Own	Own	Own	18	950-700-490	.....	2	2-3	2½-3	I. G.	.....	Yes	125
126																					126
127																					127
128	G-K	1½-Strom.	Ben.	Dixie	.....	Own	.....	Modine	Hyatt	Hyatt	Hyatt	12	850	2669	1	2½	2½	I. G.	.....	Yes	128
129	.....	-King.	.....	.....	.....	.....	.....	Modine	Hyatt	Hyatt	Hyatt	.....	400	.....	.....	2½	2½	.....	.....	.....	129
130	K	1⅜-King.	.....	Dixie	Own	Own	Sl. G.	Todd	Hyatt	Hyatt	Own	12	950	2985	1	2½-3	3	S. G.	In.	Yes	130
131	G	1¼-Strom.	Ben.	Split.	Twin	Own	Sel.	G. & O.	Gurney	Timk.	Opt.	12	.....	.....	2	2.7-3.7	2.7	G.	In.	No	131
132	G	1½-Strom.	Ben.	Eise.	B. & B.	Own	Sel.	Bremer	Hyatt	N. D.	N. D.	12	900	2600	3	1¾-4½	2½	I. G.	.....	.....	132
133	G	1-King.	Donald.	Eise.	Own	Own	Sl. G.	S. J.	.....	Own	Hyatt	8	1200	2600	2	1-3½	2½	G.	In.	No	133
134	G	-King.	Own	Dixie	B. & B.	Own	Sl. G.	G. & O.	.....	.....	.....	8	.....	1000	1	3½-5	3½	B. G.	.....	.....	134
135	G-K	1¼-King.	Ben.	Dixie	Own	Own	.....	Perfex	Hyatt	Own	Own	14	600	600	2-2½	1¾-3	2½	.....	.....	Yes	135
136	K	1½-Ben.	Ben.	Dixie	Twin	Nutt.	Sl. G.	Perfex	Timk.	Timk.	Timk.	11	900	2600	2.6-3.8	2-4	2.6	S. G.	In.	Yes	136
137	G	1 -Car.	Ben.	Berl.	B. & B.	Own	Sl. G.	James.	Schatz	Hyatt	Opt.	10	820	2650	2	1¾-4¼	2½	S. G.	.....	.....	137
138	G	1¼-Ben.	Ben.	Berl.	B. & B.	Own	Sl. G.	James.	Schatz	Hyatt	Opt.	10	800	2600	2	1¾-4	2½	S. G.	.....	.....	138
139	G-K	-Ben.	Ben.	Simms	B. & B.	Own	Sl. G.	B. & W.	Gurney	Gurney	Hyatt	10	1000	2300	2	2½-3½	2½	I. G.	In.	Yes	139
140	K	1½-Scheb.	.....	Dixie	Own	Own	Sl. G.	Modine	Hyatt	.....	Hyatt	14	750	2750	2¼-3	2¼-3	2¼-3	I. G.	Opt.	Yes	140
141	G	.....	.....	Dixie	Full.	Fuller	S. G.	Ideal	.....	.....	Timk.	12	900	.....	3	2-5	3⅜	I. G.	In.	Yes	141
142	K	1½-Strom.	Ben.	Eise.	B. & B.	Foote	S. G.	Perfex	Hyatt	.....	.....	16	600	2600	2	1½-4	2⅓	S. G.	In.	.....	142
143	D	1¼-Ens.	Donald.	Bosch	B. & B.	Own	S. G.	Own	Hyatt	.....	Hyatt	12	700	2200	3	1.5-4	2.08	B. P.	.....	.....	143
144	D	-Strom.	Donald.	Bosch	Para.	Own	S. G.	Own	Hyatt	.....	Hyatt	10-14	700	1835	2	2.06-3.28	2.06	I. G.	.....	.....	144

One and Two-Horse Tractors

145	G	⅞-King.	Ben.	.....	B. & B.	Own	Sl. G.	Own	Gurney	Own	Own	10	1000	2600	1	1½-2.4	2.4	.....	.....	Yes	145
146	G	.....	.....	Evin.	Own	Own	Sl. G.	.....	Own	.....	Own	6	200	.....	1	1¼-2¼	.....	S. G.	.....	.....	146
147	G-K	¾-King.	.....	K-W	Own	Own	Sl. G.	Own	Hyatt	Own	Own	12	780	2450	3	1½-4¼	2⅛	S. G.	Op.	.....	147
148	G-K	¾-King.	.....	K-W	Own	Own	Sl. G.	Own	.....	Own	Hyatt	12	780	2450	3	1½-4¼	2⅛	S. G.	Op.	.....	148
149	G	¾-King.	Donald.	Heinze	Own	Own	.....	S-J	.....	None	None	4½	850	900	1	¾-3	2	G.	.....	Yes	149
150	G	1 -Holl.	Donald.	Berl.	Own	Own	.....	Own	Own	Own	.....	6	.....	.....	1	1-3	2½	.....	.....	.....	150

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Motor Age Monthly Guide to Tractors

Line Number	Manufacturer	Tractor and Model	Drawbar horsepower	Belt horsepower	Number plows recommended	Size separator recommended	Pounds pull drawbar	Weight	Price	Traction	Diameter drive wheels	Make of engine	No. and type of cylinder	Bore and stroke	Normal R. P. M.
151	Elderfield Mechanics Co., Pt. Washington, N. Y.	Universal, 20	1	4	1	.....	250	750	450	.....	36	Own	1 Ver.	3½x5	1000
152	Indiana Silo Co., Anderson, Ind.	Indiana	5	10	1	.....	900	2000	.....	Wh.	50	Le Roi	4 Ver.	3½x4½	950
153	La Crosse, Trac. Co., La Crosse, Wis.	La Crosse, M.	7	12	1-16	18	1000	2600	750	Wh.	48	Own	2 Hor.	4 x6	1000
154	Market Garden Trac. Co., Minneapolis, Minn.	Market	2	4½	1-7	.....	.....	550	.....	.....	24	Veer	1 Hor	4 x4	850
155	Midwest Engine Co., Indianapolis, Ind.	Utilitor	1½	3½	1	.....	150-200	750	380	Wh.	24¾	Own	1 Ver.	3½x4½	1200
156	New Britian Mch. Co., New Britain, Conn.	New Britain, 1	3	6	1-8	.....	400	650	450	Wh.	26½	Own	2 Ver.	2¾ x 4	1500
157	New Britain Mch. Co., New Britain, Conn.	New Britain, 2	3	6	1-8	.....	400	750	500	Wh.	32	Own	2 Ver.	2¾ x 4	1500
158	Oldsmar Tractor Co., Oldsmar, Fla.	Oldsmar	1-3	5	1	.....	150-450	1200	375	Wh.	32	Evin.	1 Ver.	5 x 5½	580
159	Scientific Farming Mchy., Minneapolis, Minn.	Princess Pat	12	25	2	24 x 26	2000	3500	1,750	Wh.	46	Buda	4 Ver.	4¼ x 5½	1000
160	Tillermobile Co., Minneapolis, Minn.	Tillermobile, A	2	6	1-8	.....	.....	625	385	Wh.	30	Veer.	1 Ver.	4 x 4	1200
161	Toro Motor Co., Minneapolis, Minn.	Toro	.....	12	1	.....	1100	2400	900	Wh.	42	Le Roi	4 Ver.	3½ x 4½	1200

Motor Cultivators

162	Avery Co., Peoria, Ill.	Avery, C	.....	.....	.....	.....	.....	3450	.....	Wh.	38	Own	4 Ver.	3 x 4	1200
163		Avery, 5-10	5	10	.....	.....	.....	3050	.....	Wh.	38	Own	4 Ver.	3 x 4	1200
164	Bailor Plow Mfg. Co., Atchison, Kans.	Bailor, A	6	.....	.....	.....	.....	2150	925	Wh.	44	Le Roi	4 Ver.	3½ x 4½	1000
165		Bailor, W	6	.....	.....	.....	.....	1800	775	Wh.	40	Le Roi	4 Ver.	3½ x 4½	1000
166	Detroit Culto-Tractor Corp., Detroit, Mich.	Detroit Culto, AA	9	16	2	20 x 28	1600	1800	775	Wh.	42	Own	2 Ver.	4 x 6	400
167	Emerson-Brantingham Co., Rockford, Ill.	E-B	.....	.....	None	.....	.....	3200	.....	Wh.	42	Le Roi	4 Ver.	3½ x 4½	100
168	Parrett Motor Corp., Chicago.	Parrett, . ..	6	12	2	none	.....	3000	890	Wh.	44	Le Roi	4 Ver.	3½ x 4½	1000
169	Rock Island Plow Co., Rock Island, Ill.	Heider, 0	6	10	1	.....	.....	2700	.....	Wh.	46	Le Roi	4 Ver.	3½ x 4½	.....
170	Shaw Enochs Trac. Co., Minneapolis, Minn.	Shawnee	6	12	1	.....	1100	2600	.....	Wh.	60	Le Roi	4 Ver.	3½ x 4½	1200
171		Shawnee	9	18	2	22	2100	3800	.....	Wh.	60	Gray	4 Ver.	3½ x 5	1200
172	Toro Motor Co., Minneapolis, Minn.	Toro	.....	.....	.....	.....	1100	2800	.....	Wh.	42	Le Roi	4 Ver.	3½ x 4½	1200

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THE PNEUMATIC TRUCK TIRE

(*Continued from page 41*)

While such may not give a 100 per cent efficiency in the pneumatic tire truck, it is a step in the transition program. Keeping in mind the fact that the great value of the pneumatic tire comes in pulling up the slow speed average rather than in increasing the high speed of the truck, it is possible to accomplish great advantages for the pneumatic without getting the engine outside of the range of crankshaft speed that it is capable of enduring.

The opening chapter in redesigning engines for pneumatic tires has yet to be written.

What axle makers will do by way of redesigning for the pneumatic is not yet definitely settled. They are carrying on experimental work. The general feeling is that axle ratios will remain about as they are but that weight will be reduced.

Goodyear in its experimental work has been developing the double rear axle which gives a six-wheel truck. Instead of two rear wheels there are four mounted close together like the four wheels under one end of a street car. Goodyear has developed a truck of this character which it has had operating for several months, and which, during the coming summer, will be demonstrated in different parts of the country. As far as can be learned from riding in this truck, the double axle is entirely satisfactory. It functions satisfactorily.

Again the question of double cost may be suggested but here Goodyear advises that on a 6-ton truck, two 3-ton axles cost considerably less than one axle suited for 5 or 6-ton capacity. The company also argues that four relatively smaller tires as used on the rear wheels of such a truck cost less than two bigger tires. It is the same argument that two smaller gearboxes may cost less than one larger one.

As to whether the six-wheel vehicle will become a permanent design, engineers are not agreed upon. Those advocating it declare that we must throw aside the tradition that because horse wagons for centuries have had four wheels that the motor truck must have four wheels. There must be some trail blazing. It is a subject that engineers must give their attention to. The person who condemns it on general principles without studying its possibilities is not doing the most constructive thing for the development of the motor truck.

No effort will be made here to attempt to tell how weight can be reduced in the frame, steering gear, truck body, etc.

One important chassis change for pneumatics is that of brakes. When you jump the speed of a vehicle from 12 to a possible 24 or 30 m.p.h. you must have better brakes. It takes more braking power to control the truck at 24 m.p.h. than it does at 12 m.p.h.

The major problem in greater brakes is that with a wheel 24 in. in diameter, the brake drum has to be practically of the same diameter as the wheel to give adequate braking area. It is possible to make the brake drums wider, which is being done, but there are limits that prescribe the maximum width.

Truck makers are looking to the possibility of fitting brakes to the front wheels as well as on the rear wheels. Front wheel brakes were fitted on passenger motor cars in Europe ten years ago. At the motor car exhibitions held last fall in Paris and London a couple of high priced cars were shown with brakes on the rear and front wheels. Front wheel brakes are not experimental. Whether they are fitter or not is largely a question of cost. Their advantages on passenger cars are recognized. There is a still greater necessity for them on motor trucks.

The six-wheel truck developed by Goodyear, has a brake on each of the four rear wheels and in demonstrating this truck with a 6-ton load the advantages of such brakes were apparent. They control speeds as high as 26 m.p.h. was as great as that of a passenger car at the same speed. Generally speaking brakes have not been adequate enough on motor trucks and improvement in this line will be greatly appreciated.

There is still another change that must follow with the introduction of the pneumatic tired truck, that is equipping our garages, service stations and the private garages and service stations of fleet owners with air compressors that will give pressures up to 140 lb. and furnish adequate volume of air so as not to require too much time, taking care of a truck.

Definite figures to-day are unavailable as to the number of garages, public and

and Their Technical Specifications

Line No.	Fuel	Make and size of carburetor	Make of air cleaner	Make of magneto	Make of clutch	Make of gearset	Type of gearset	Make of radiator	Make of bearings in transmission	Make of bearings in front axle	Make of bearings in rear axle	Belt pulley diameter	Belt pulley R. P. M.	Belt Speed F. P. M.	Speeds forward	Speed range M. P. H.	Recommended plowing speed	Final Drive	Drive	Furrow wheel	Line No
151	G	⅞-Zen.	.....	A-K	Own	Own	.....	Main	.....	.....	.....	6	1000	.....	1	1-3	2	Worm	.....	.....	151
152	K	⅞-King.	Ben	A-K	Own	Own	Sl. G.	Cand.	.....	.....	.....	.....	1200	.....	1¼-4	.....	.....	Ch.	Op.	.....	152
153	K	1¼-King.	Ben.	.....	Own	Own	Own	Hopper	.....	Own	Own	10	1000	2600	1	1¾-2½	2½	.....	.....	Yes	153
154	G	1½-Verac.	Ben.	Berl.	Own	Own	Spec.	.....	.....	Timk.	.....	6	2000	.....	1	1½-2½	2½	Worm	.....	.....	154
155	G	¾-King.	Own	Eise.	Own	Own	.....	Modine	.....	.....	.....	4½	1200	1200	1	1-4	2¼	I. G.	In.	.....	155
156	G	¾-King.	Ben.	Dixie	Own	Own	.....	G. & O.	Own	.....	.....	5½	1500	2160	1	1-3	.....	B. G.	In.	.....	156
157	G	¾-King.	Ben.	Dixie	Own	Own	.....	G. & O.	Own	.....	.....	5½	1500	2160	1	1-3	.....	B. G.	In.	.....	157
158	G	1 -Scheb.	Own	Opt.	Own	.....	.....	None	Own	.....	.....	5	580	240	2½	.....	2½	.....	.....	.....	158
159	K	1¼-Ben.	Martain	Dixie	B.&B.	Own	Sl. G.	S-J	Hyatt	Hyatt	Hyatt	12	1000	3100	2	2½-4½	2½	I. G.	In.	Yes	159
160	G-K	-Verac	Own	Berl.	Own	Own	D. R. -	.....	.....	.....	.....	11	.....	.....	1	1-3	2½	B. G	.....	.....	160
161	G	⅞-King.	Ben.	Eise.	Own	Own	Sl. G.	B.&W.	Opt.	.....	Hyatt	8	1200	2400	2	1-3½	3½	B. G.	In.	.....	161

Motor Cultivators

162	G-K	¾-King.	.....	K-W	Own	Own	Sl. G.	Own	Hyatt	Own	Own	12	780	2450	3	1½-4¼	2⅛	S. G.	Op.	.....	162
163	G-K	¾-King.	.....	K-W	Own	Own	Sl. G.	Own	Hyatt	Own	Hyatt	12	780	2450	3	1½-4¼	2⅛	S. G.	Op.	.....	163
164	G	⅞-King.	Ben.	Dixie	B.&B.	.....	.....	Perfex	.....	Hyatt	Hyatt	.....	.....	.....	2	2½-3.7	.....	Ch.	.....	.....	164
165	G	⅞-King.	Ben.	Dixie	B.&B.	.....	.....	Perfex	.....	Hyatt	Hyatt	.....	.....	.....	2	2½-3.7	.....	Ch.	.....	.....	165
166	G	1¼-Strom.	Own	Bosch	Own	Own	Sl. G.	Own	Hyatt	Own	Own	8	885	1800	2	1-3	2⅛	B. G.	In.	.....	166
167	G	-Holl.	Ben.	Dixie	Own	None	None	Perfex	Hyatt	Own	Hyatt	7⅛	995	.....	1-5	1½-3½	None	.....	.....	.....	167
168	G	¾-King.	Own	Eise.	B.& B.	Own	Sel.	Modine	S.K.F.	Hyatt	Hyatt	6	1000	.....	2	1.3-3.5	.....	I. G.	.....	No	168
169	G	⅞-King.	Ben.	Dixie	.....	.....	.....	Perfex	Opt.	.....	.....	.....	.....	.....	.....	1½-3½	.....	B. G.	Op.	.....	169
170	G	1-Scheb.	Ben.	Berl.	B. &.B.	Own	Sl. G.	Todd	Fafnir	.....	Hyatt	8	.....	2600	2	2-3.1	3.1	.....	In.	Yes	170
171	G	1-Scheb.	Ben.	Berl.	B. & B.	Own	Sl. G.	Todd	Fafnir	.....	Hyatt	8	.....	2600	2	2-3.1	3.1	.....	In.	Yes	171
172	G	⅞-King.	Ben.	E.&D.	Own	Own	Sl. G.	B.& W.	Opt.	.....	Hyatt	8x6	1200	2400	2	1-3½	.....	B. G.	In.	.....	172

Abbreviations: **Traction**—Wh., wheel; Cr., crawler. **Engine**—Beav., Beaver; Veer., Veerac; Herc., Hercules; Wauk., Waukesha; Buff., Buffalo; Asso., Associated Manufacturers; Auto., Automatic; Weid., Weidely; Clim., Climax; Twin, Twin City; Cont., Continental; Ruten, Rutenber; Over., Overland; Kenn., Kenneth. **Cylinders**—Ver., Vertical; Hor., horizontal; Opp., opposed. **Fuel**—G, gasoline; K, kerosene; D, distillate. **Carburetor**—Ray., Rayfield; King, Kingston; Holl., Holley; Scheb., Schebler; Ben., Bennett; Web., Webster; Zeph., Zephyr; Ens., Ensign; Strom., Stromberg; Till., Tillotson; Zen., Zenith; Car., Carter. **Air-Cleaner**—Donal., Donaldson; Ben., Bennett; Hol., Holley. **Magneto**—A-K., Atwater-Kent; Sum., Sumter; Eise., Eiseman; Berl., Berling. **Clutch**—B. & B., Borg & Beck; Bier., Bierman; Mun., Muncie; Rock., Rockwood; spec., special. **Gearset**—B. & S., Brown & Sharpe; Nutt., Nuttall. **Gearset type**—Sl. G., sliding gear; Sel. G., selective gear; Fr., friction; Plan., planetary; Sl. J. C., sliding jaw clutch. **Final Drive**—S. G., spur gear; Ch., chain; D. R., double reduction; B. G., bull gear. **Drive**—Op., open; In., inclosed.

private, as well as service stations, that are fitted with air compressor systems capable of caring for the Giant pneumatic. Any figures given here are guesses. Our maker estimates that not more than 10 per cent of the garages and service stations are equipped to handle the giant pneumatic. This means a great business in installing garage compressors adequate to the job.

There are many manufacturers of garage compressor systems and these concerns are developing compressors suitable for the work. Some of the large manufacturers have compressor units that have been used for other jobs and are suitable for garages. The compressor units sold to many garages have been the smallest units made by some of the manufacturers so that the development of new types for Giant pneumatics is not necessary.

The garage that is going to handle trucks with pneumatics will have to fit up especially for the job. It may be necessary to pipe the air around the walls on each floor and have take-offs so that the tires on the trucks can be checked up at night without moving the trucks around the garage to one air hose. This is going to add to the cost of installation but seems to be the only desirable method of handling it. If a garageman has forty motor trucks with pneumatic tires it is some job checking up all of the tires and one hose would not be adequate. The difficulty of moving motor trucks about a garage is greater than that of passenger cars.

The cost of compressor installation to care for forty to fifty trucks may range from $900 to $1200 depending on the make and type of equipment used. The purchaser will generally have the option of two lines, one a cheaper line with higher maintenance cost and the other more expensive but with reduced maintenance.

The use of pneumatic tools in the repair shop will undoubtedly follow the equipping with compressor system for pneumatic tired trucks because the compressor system will give sufficient volume of air and pressure to operate the pneumatic tools used in repair work.

The question of servicing the truck pneumatic has already been well organized by many of the tire manufacturers. They recognize that the day a truck with pneumatic tires reaches a certain town their tire agent must be advised. He must get acquainted with the truck owner and see to it that the tires are being properly cared for. The cost of the truck pneumatic is such that there must be no running at too low a pressure. If cuts appear on the tread they must be repaired.

Some of the leading tire makers require a line of repairs to be carried in each town or city where there are pneumatic trucks. These repairs consist of reliners in case of tread injury; blowout patches; and cement for repairing tread cuts. This equipment takes care of practically all the troubles that arise.

Where vulcanizing has to be done on giant pneumatics larger vulcanizing equipment and tire moulds are needed. For several months manufacturers of such equipment has been getting into production. There are two or three manufacturers of tire moulds who have already sold moulds suitable for repairing all the large sizes. It will not be long before such equipment will be more or less general.

The success of the giant pneumatic will very largely depend on the service it receives and tire manufacturers are insisting on inspection systems by means of which they hope the tire will get a fair treatment. Some are arranging for inspection every two weeks. This includes checking the inflation. Examining of the treads or cuts is included. Testing the wheels for alignment is a portion of the inspection. There are other inspections made. Good effort is being made to introduce cost systems by truck operators so that the economy of the pneumatic will be early recognized. Tire makers are showing a commendable spirit in doing their part to see that the truck user gets as much mileage as the tire is capable of giving.

A CORRECTION

In the advertising section of our issue of February 26th there appeared an unsigned 4-page article entitled "Lubrication." This should have been labeled "advertisement" as it was advertising matter of one of our clients. The same applies to the 2-page article that ran in our March 4th issue.

From the Four Winds

Glimpses at the World of Motordom

Coming Motor Events

AUTOMOBILE SHOWS

Kingston, Ont.	First Annual Show	April 27 to May 1
Anaheim, Cal.	First Annual Show Orange County Automobile Trade Ass'n	May 5-8
Macon, Ga.	Macon Automobile Dealers' Ass'n	May 6 to 8
Northampton, Mass.	Annual Automobile Show	Oct. 6-8

FOREIGN SHOWS

Antwerp	Cars, Tires, Wheels, Parts and Equipment	May 15-June 13
Antwerp	Commercial Vehicles, Tractors, Trucks and Engines	June 26-July 25
Antwerp	Motorcycles, Side Cars, Parts and Equipment	Aug. 7-Sept. 15
London, Eng.	Commercial Vehicles Exhibition, Olympia	October
London	Passenger Car Show, Olympia	November

CONVENTIONS

Charleston, S. C.	South Carolina Automotive Trade Ass'n	June 24, 25

RACES

Indianapolis Speedway	500-Mile Race	May 31
Uniontown, Pa.	Speedway Race	June 12
Tacoma, Wash.	Speedway Race	July 5
Paris, France	Grand Prix Race, Sporting Commission	August
Cincinnati, O.	Speedway Race	Sept. 6
Uniontown, Pa.	Speedway Race	Sept. 6

TOURS

Omaha, Neb.	Truck Reliability Run	June 1
Milwaukee, Wis.	Wisconsin Truck Tour, Milwaukee Sentinel	June 21-26
Lake Huron Tour		July 4
New York-San Francisco	Glidden Tour	September

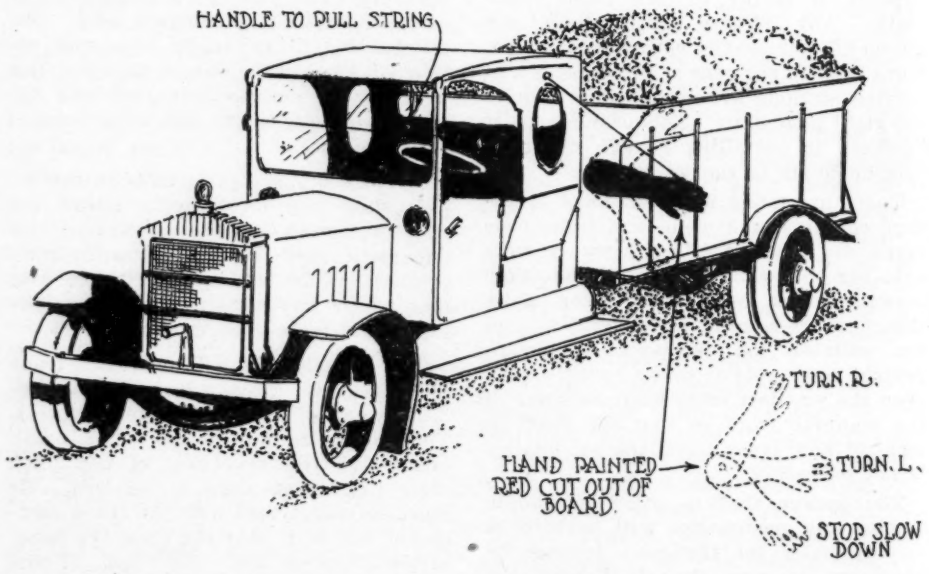
Texas Car Demand Growing—If the people of Texas keep buying motor cars and trucks at the present rate during the year 1920 there will be 406,894 cars registered with the State Highway Commission at the end of the year. Figures announced for the first three months of this year show that the number of registrations reaches the total of 316,894, which lacks but some 14,500 of being equal to the entire number listed last year. The figures have already passed those for 1919 in most of the more populous counties. So fast have registrations been coming in, that at one time the Highway Commission exhausted its supply of license plates.

General prosperity, due to the oil development in the state, and to the present high prices for cotton and other agricultural products, are assigned as reasons for the great demand for automobiles. Farmers are buying cars just as fast as their city brothers, and bond issues running to nearly $9,000,000 have already been voted this year for the construction of highways in different sections of the state.

The cities are already beginning to face the problem of increased motor car traffic. In Houston, for example, there is quite an agitation for the removal of the street car tracks from the principal downtown streets to give the automobile traffic more room. From Dallas comes word of the proposed erection of a six-story down-town garage to provide parking space for cars. Oil companies can hardly build filling stations in the principal cities fast enough to keep pace with the demand for gasoline and lubricating oils.

Marking Canadian Roads—The Provincial Department of Public Works, Fredericton, N. H., are preparing to have road signs placed on all trunk highways as well as all important by-roads. In the Legislature the past week the Hon. P. J. Veniot, Minister of Public Works, announced that a contract had been awarded for manufacturing and painting the signs and they would be placed in position just as early in the season as possible.

Hold Trucks Ready for Emergency—Hundreds of army trucks, stored at the Ohio state fair grounds, ready to be delivered to various counties in Ohio for road building and repair have been put into condition to inaugurate a motor truck transportation system in case there is a shortage of food and other necessaries, due to the trainmen's strike. These trucks are in good condition, many of which have the names of the counties to which they were assigned, painted on the bodies.



California has some very stringent rules and regulations concerning motor cars on the highways, and one is that when making a turn to the right the arm must be held upward in an oblique position. Straight out indicates that the car is to come to a stop or slow down, while if the arm is in a downward oblique position it is a signal that the car is to turn to the left. A Los Angeles truck driver could find no way of signaling because of the width of the cab and the wide loads he carried, but his ingenuity came forth. He provided himself with a wooden arm a couple of feet long and on the end of this he painted a bright red hand; or, rather the hand was formed and then was painted. To operate it he pivoted it on the side of the cab, and then ran a cord from the hand through a hole in the cab. All that was necessary then was to pull the cord and raise the wooden hand to any position desired